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Vol. 154, No. 3 July 20, 1944

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MAHON *Fabricated* WELDMENTS

A battery of multiple flame cutters, similar to that shown to the right, cuts several duplicate parts simultaneously. Handles steel plate from ½ inch to 16 inches in thickness.

This diesel engine crankcase and cylinder block assembly is an excellent example of the ability of the Mahon organization to accurately fabricate even the most massive and difficult welded steel plate products. It indicates, too, how comprehensive are the applications of this superior construction.

Meeting
the call for MORE and MORE
takes a world of Modern Equipment
. . . *and Mahon has it!*

The past couple of years has produced such a tremendous demand for Mahon welded steel plate products we have been hard pressed at times to provide facilities to maintain production schedules. Frequently, when it was impossible to procure the type of modern equipment we needed, we designed and built it ourselves. As a result we now have one of the best equipped and best manned plate shops in the country. Devoted exclusively to war production at present, we are also looking to the future. Our own design engineers are working with engineering staffs of many different industries—developing products for peacetime application. Can you also use this experienced assistance?

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The IRON AGE

ESTABLISHED 1855

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July 20, 1944

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Fiddling in the Fog

NERO fiddled while Rome burned, so the story goes, although we haven't any photographs of him doing so to prove it. Since then this expression has become accepted as typing indifference to public needs or ineptness in meeting them.

If Nero had carried pails of water or directed the efforts of the firefighters on that historic occasion he would have been better employed than in making hot music. But such ordinary performance of public duty would not have put him in headlines.

Nero as a hero was a zero. His sense of news values was better developed than his sense of duty to the public.

I sometimes wonder if this is not true of some of our present day statesmen, especially in an election year, when headlines are prized more than ever by politicians.

I think some of them are fiddling in the fog.

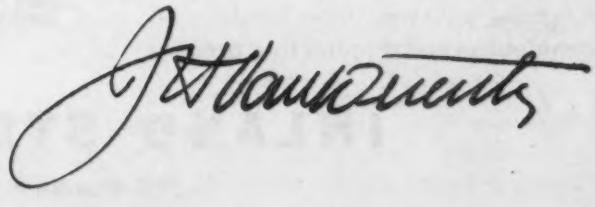
There was no fog over Rome the night that it burned. Nero could see what he was doing, made his choice of what to do and did it. Give him credit for being forthright about it.

American business and industry are not burning up today, perhaps thanks to some 3000 miles of ocean, but they are enveloped in a dense fog that makes it impossible for their leaders to look ahead. The weak squeaks of political virtuosos which are heard in the fog do not help any.

American businessmen and industrialists have heard a great deal about the rebuilding job that we are going to do for the world and it sounds very impressive and noble if you like that kind of chin music. I would like to hear something definite about plans for rebuilding America. It's going to take some very definite and practical rebuilding to make room for the millions of returning sons from overseas.

Passing laws to give our ex-service men dismissal pay is all very well but it won't do what is needed to be done. Money in a weekly pay envelope is better than a "once and for all" check from Mr. Morgenthau.

Congress can be a great help but employers are the people who have to create and furnish employment. And one of the best things that Congress could do for them and for the country would be to stop fiddling in the fog and get out a brass tack program that will let employers have at least a faint idea of how much money they will have left to invest in postwar employment after the tax collector gets through with them.



Millions are "*Injured*" by a Single Accident

Not so many months have passed since an accident meant little more than some personal loss and a temporary, but easily adjusted, work schedule. Today, that situation is completely changed.

Every accident of the 9,000,000 that occur annually is a national liability, affecting, not only the output of the injured worker's shop, but also the production of other shops. Yes, a single accident "injures" millions —millions of other workers who are trying desperately to reach maximum war output—millions of American citizens who are striving to retain their freedom—millions of American fighting men who never can have all the equipment and supplies they need for Victory so long as America is careless on the home front. Anything you can do to prevent accidents will be a real contribution to America's fight for freedom. Remove hazards at home, drive carefully, be considerate of others in traffic, observe safety rules when at work, promote safety and safety programs no matter what your position may be.

Start today! Think safety, promote safety! Keep more workers on the job for Victory!

Let's All Back the Attack with War Bonds

INLAND STEEL COMPANY

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The IRON AGE

July 18, 1944

NEWS FRONT

► OPA has granted Pittsburgh Steel increases in its prices of ingots, up $2.10 a ton; blooms, up $4.25 a ton; and billets, up $9.50.

► Appearance of peacetime products will undoubtedly be slowed up because of the inexperience of workers. What has already been made for limited civilian consumption has shown a high percentage of defects due to improper assembling.

► Maury Maverick, while fanning the flames of sectionalism on his recent trip to the West Coast, expressed his belief in the need for an extension of the life of SWPC for a "couple of years", since there are probably 2 million contracts and sub-contracts to be cleaned up and bankruptcy will result if settlement is not prompt.

► British factory-made steel houses for postwar rehabilitation have undergone some alterations in layout and design since the prototype went on inspect. They are expected to cost about $2200, including stove, sink, refrigerator and other tenants' fixtures.

Production of the houses may start in November. They will be publicly owned and licensed to tenants.

► One June 11 the Soviet government published a detailed list of all materials received from the U. S., Great Britain and Canada. Between 10 and 15 per cent of materials dispatched was lost in transit through enemy action

The U. S. sent 6430 aircraft, 3734 tanks, 206,771 trucks and 22,400,000 shells. Great Britain and Canada sent 5826 aircraft, 5480 tanks, 8649 trucks and 17,827,999 shells. One-third of British material was sent as "military aid without payment".

About 5½ million pairs of Army footwear and nearly 23 million yards of cloth went to the U. S. S. R. from U. S. Britain sent 6491 lathes, 15,084 electric motors, 374,000 kw of power-plant equipment. All three countries sent large quantities of light metals.

► Metlbond, a "glue" in liquid, paste and tape forms by Consolidated Vultee Aircraft Corp. is used to attach plexi-glass to aluminum, glass to glass, etc. The joints have a shear strength of 3000 lb. per sq. in., after curing at 330 deg. F.

► Toolite, a new thermosetting plastic made by Adhere, Inc., Los Angeles, is lighter than magnesium, has compressive strengths up to 20,000 lb. per sq. in., and can be cast to 1/32 in. of exact size. It has been used for legs and arms of radial drill presses, and may soon be used for structural airplane parts.

► Current German home propaganda reports the fighting in great detail, stresses Allied losses, declares they are throwing in troops at a spendthrift pace while Germany shepherds its own reserves.

Propaganda to the Dutch and Belgians is "see what might happen if the horrors of invasion reached your shores;" to the French the word is: "Keep quiet. Don't get into trouble. Spare yourselves by avoiding the war;" to the Allies, effort is made to play off Briton against American and both against Russians, with atrocity stories from the front line, of thousands of Allies killed in horrible ways, with the question asked, "what is the use of it all?"

► The official British description of the "flying bomb" is "pilotless aircraft"; American flyers call them "doodle bugs"; Allied newspapers call them "robot bombs"; and the British Broadcasting Co., with characteristic aplomb, call them "things". "Flying bombs" is the name that will likely stick.

► Berlin has announced that Luftwaffe Major Jabs destroyed two of a formation of eight Spitfires over Berlin with "a new type of aircraft", probably the jet-propelled Messerschmitt Schwalbe (Swallow) single-seat fighters now undergoing service tests.

► Band instruments are now being made in regular commercial quantities by electroforming or building up by electrodeposition. The technique differs radically from ordinary plating practice and calls for the last word in control equipment. Mechanical ingenuity is probably the most important factor in solving the problems encountered.

► A new bright alloy plate consisting of ternary deposits of copper, tin and zinc, has been made available commercially. The alloy is bright as deposited, hard, has good tarnish resistance, is non-magnetic and has high protective value over copper or copper alloys. It is recommended to replace nickel plate.

Manufacture of 152

. . . The 152 mm. shell case made for the French battleship Richelieu. It's the longest of its kind used on any ship. The glamour is being provided by French-born Lily Pons, who has just autographed the V symbol on the shell.

o o o

By W. W. SOPHER
Director, Chicago Metallurgical Laboratory, and

G. J. FOSS, JR.
Chief Metallurgist, Eastern Division. Rheem Mfg. Co.

WITH the liberation of North Africa by Allied forces the battered remnants of the French fleet made the hazardous Atlantic crossing and were docked at the Brooklyn Navy Yard in January, 1943. The ships included cruisers and destroyers and the mighty 35,000-ton battleship, Richelieu.

One of the most serious problems encountered in refitting concerned the ordnance of the French ships. There was a choice between two alternatives. The first was to dismount all of the guns and regun with American ordnance. Further investigation indicated that this would involve not only replacing the guns but would also require the complete refitting of the loading arrangement and possibly replacing all ammunition hoist equipment. Aside from this there would be an appreciable delay while French crews became familiar with American ordnance. The other choice was to ask American industry to undertake the manufacture of all of the necessary ammunition components required for the French guns. The latter choice was finally decided to be the most feasible.

The secondary batteries of the Richelieu and the cruisers and the main armament of the larger destroyers are 152 mm. rifles. The Richelieu alone carries 15 of these guns.

The problem of providing cartridge cases for this unusual caliber was expected to prove especially difficult. The cases are approximately 44 in. long and weigh approximately 45 lb. They correspond roughly to the U. S. Navy's 6 in. cases. They are, however, larger across the base diameter and considerably longer than the 6 in. case. Bureau of Ordnance experts regarded the 152 mm. cartridge case as the most difficult manufacturing problem yet to be undertaken in this field.

To these considerations must be added the fact that the precipitate flight of these units of the French fleet from their home ports in France left their crews with very little technical information and few or no drawings concerning items of ordnance carried by the ships. Much of the specifications and methods of manufacture, therefore, were left to the memory of engineering officers attached to the ships or other officers who were fortunate enough to escape from France.

The 152 mm. cartridge case was hardly so unfortunate. There were available drawings of the finished case and there were samples of the French cartridge cases themselves. But, there were no methods of French manufacture available nor was there much in the way of raw material specification such as chemical composition, grain size, and physical properties. Neither was there available the required physical properties on the finished cartridge case.

Preliminary examination of the French case indicated that the original supply had been manufactured from an aluminum bronze with a somewhat higher percentage of nickel, iron and manganese than is found in the typical American analysis.

Chemical and spectrographic analysis of sample drillings was as follows: Copper, 92.87; aluminum, 5.49; iron, 0.25; nickel, 0.065; manganese, 0.10; tin, 0.02; silicon, 0.02; and zinc, nil. Qualitative spectrographic analysis showed no zinc.

The Bureau of Ordnance, Navy Department, after considering the material analysis and the French design modified the case design and prescribed that it be manufactured from conventional 70 copper, 30 zinc, American cartridge brass, and in accordance with Ordnance Specification No. 20 for the 6 in. 47 caliber case used by the U. S. Navy.

Ordnance engineers of Rheem Mfg. Co. then developed a method of manufacture based on the conventional cup and draw method consisting of a cupping operation and five ironing draws with intermediate anneals. The calculated press loads all fell within the rated press loads for the draw presses but in some cases with very small margins of safety.

With the method of manufacture finally decided upon the following sequence of operations was established:

Disk Specifications:

The cases were manufactured from U. S. Navy inspected, cartridge case brass disks made according to Ordnance Specification No. 1051.
Size: 16x0.813 + 0.010 in.
Desired grain size: 0.055 to 0.120 mm.
Desired hardness range: 50 to 65 Rf.

mm. Brass Cases

. . . for the French Navy

. . . Herein are details on what is probably the most difficult manufacturing problem yet undertaken in the brass cartridge case field, that of 152 mm. French cases about 44 in. in length, produced by the conventional cupping operation and five ironing draws with intermediate anneals. Particularly interesting is the aluminum bronze from which the original French cases were made, which is stronger than conventional alloys of this type due to the presence of nickel, iron and manganese.

Cupping (*Operation No. 1*)

Press: 400 ton Bliss hydraulic press, 36 in. stroke, single action.
Average press load: 375 to 380 tons.
Average height of cups: 8.25 in.
Outside diameter: 9.314 in.
Inside diameter: 7.777 in.
Reduction in wall thickness: 0.7 per cent.
Maximum eccentricity: 0.012 in.
Desired hardness of cups: 100 to 105 Rr.
Cupping punch: Water-hardening tool steel.
Cupping die: Oil-hardening tool steel—high carbon, tungsten steel with 0.5 per cent molybdenum added.

Annealing Cups (*Operation No. 2*)

Type of oven: Direct, gas fired recirculating.
Oven temperature: 1130 deg. F.
Time in oven: 75 min.
Baskets: The baskets were made of acid and heat resistant steel, welded in construction.
Basket size: 53x33x12 in.
Pieces per basket: The cups were placed in the baskets mouth down in one layer, 17 cups to the basket.
Desired hardness after annealing: 50 to 65 Rr.

Pickling, Rinsing Cups (*Operation No. 3*)

Pickling unit: Metal wash, spray type pickler.
Chamber No. 1—Ten per cent sulfuric acid with 2½ per cent of Ferrisul added. The acid temperature was maintained between 110 deg. and 115 deg. F.
Chamber No. 2—Cold water rinse.
Chamber No. 3—Soap solution for coating the cups to aid in the next drawing operation.

First Draw (*Operation No. 4*)

Press: 250 ton Bliss hydraulic press, 36 in. stroke, single action.
Average press load: 170 to 175 tons.
Average height of draw pieces: 10 in.
Outside diameter: 8.846 in.
Inside diameter: 7.746 in.
Reduction in wall thickness: 28.5 per cent.
Maximum eccentricity: 0.0095 in.
Desired hardness after drawing: 100 to 105 Rr.
First draw punch: Same as cupping punch.
First draw die: Same as cupping die.

Anneal of First Draw Pieces (*Operation No. 5*)

Same as operation No. 2 except that 18 pieces were placed in each basket in one layer.
Desired hardness after annealing: 50 to 65 Rr.

Pickling, Rinsing First Draw Pieces (*Operation No. 6*)

Same as operation No. 3.

Second Draw (*Operation No. 7*)

Press: 250 ton Bliss hydraulic press, 60 in. stroke, single action.
Average press load: 130 to 135 tons.
Average height of draw pieces: 14.5 in.
Outside diameter: 8.448 in.
Inside diameter: 7.717 in.
Reduction in wall thickness: 33.5 per cent.
Maximum eccentricity: 0.0095 in.
Desired hardness after drawing: 100 to 105 Rr.
Second draw punch: Same as cupping punch.
Second draw die: Same as cupping die.

Second Draw Anneal (*Operation No. 8*)

Same as operation No. 2 except that 20 pieces were placed in each basket in one layer.
Desired hardness after annealing: 50 to 65 Rr.

Pickling, Rinsing Second Draw Pieces (*Operation No. 9*)

Same as operation No. 3.

Third Draw (*Operation No. 10*)

Press: 250 ton Bliss hydraulic press, 108 in. stroke, single action.
Average press load: 110 tons.
Average height of draw pieces: 21 5/16 in.
Outside diameter: 8.155 in.
Inside diameter: 7.692 in.
Reduction in wall thickness: 36.9 per cent.
Maximum eccentricity: 0.008 in.
Desired hardness after draw: 100 to 105 Rr.
Third draw punch: Same as cupping punch.
Third draw die: Same as cupping die.

Third Draw Anneal (*Operation No. 11*)

Same as operation No. 2 except that 23 pieces were placed in each basket in one layer.
Desired hardness after annealing: 50 to 65 Rr.

Third Draw Pickle, Rinse (*Operation No. 12*)

Same as operation No. 3.

Fourth Draw (*Operation No. 13*)

Press: 125 ton Bliss hydraulic press, 108 in. stroke, single action.
Average press load: 55 tons.
Average height of draw pieces: 34⅞ in.
Outside diameter: 7.992 in.
Inside diameter: 7.666 in.
Reduction in wall thickness: 50.5 per cent.
Maximum eccentricity: 0.008 in.
Desired hardness after drawing: 100 to 108 Rr.
Fourth draw punch: Same as cupping punch.
Fourth draw die: Same as cupping die.

Fourth Draw Trim (*Operation No. 14*)

The fourth draw pieces were trimmed on a rotary trimmer to a uniform length of 26.75 in.

Fourth Draw Anneal (*Operation No. 15*)

Same as operation No. 2 with the following exceptions:
Temperature of oven: 1100 deg. F.
Time in oven: 60 min.
Pieces per basket: 23.
Desired hardness after annealing: 55 to 70 Rr.

Pickle, Rinse Fourth Draw Pieces (*Operation No. 16*)

Same as operation No. 3.

Fifth Draw (*Operation No. 17*)

Press: 125 ton Bliss hydraulic press, 108 in stroke, single action.
Average press load: 55 tons.
Average height of draw pieces: 48 in.
Outside diameter: 7.872 in.
Inside diameter: 7.660 in.
Reduction in wall thickness: 35.5 per cent.
Maximum eccentricity: 0.007 in.
Desired hardness after drawing: 105 Rr minimum.
Fifth draw punch: Same as cupping punch.
Fifth draw die: Same as cupping die.
Note: Due to difficulties in drawing, pigmented drawing compounds were necessary in all draws. In the fifth draw colloidal graphite was used with steel dies. When the carbide die was installed ordinary water soluble drawing compound was all that was necessary.

Fifth Draw Trim (*Operation No. 18*)

The fifth draw pieces were trimmed to a uniform length of 43⅝ in.

Heading (*Operation No. 19*)

Press: 2800 ton Bliss hydraulic press, 12 in. stroke, single action.
The cases were placed in the heading post and die assembly and were moved under the bumpers by means of a dial feed. The bumpers were located in a secondary dial which was a part of the ram. This dial had four stations each containing one bumper. The surface contours of the bumpers varied depending upon which direction the metal was to be moved. After each bump was completed, the upper dial moved to the next station. Each complete revolution of the upper dial completed one case.
Average press load: First bump: 2250 tons; second bump: 1900 tons; third bump: 2300 tons; fourth bump: 2400 tons.
Thickness of head after heading: 0.520 to 0.560 in.
Desirable hardness after heading: ½ in. from edge of flange: 102 to 105 Rr; ¼ in. from edge of counter bore: 102 to 105 Rr.
Allowable extent of cold shut: 0.1204 in. The extent of the cold shut is a function of the bumpers. When the cold shut exceeds 0.1204 in. it is necessary to rework the bumpers.

Heading tools: The heading post nose, heading die ring, and bumpers were all made of an oil-hardening tool steel used where compression and shock resistance is necessary.

Wash After Heading (Operation No. 20)

Washer: Two stage spray type washer. This operation was necessary to remove the drawing compound from the fifth draw and the compound used on the heading post and the bumpers.
Chamber No. 1—Mild alkali cleaner used at a concentration of 1 oz. per gal. (Metax 300 AS.)
Chamber No. 2—Hot water rinse. Temperature 120 deg. to 140 deg. F.

Pre-Taper Anneal (Operation No. 21)

The cases were flame annealed from the mouth to a point 9 in. from the base. This was to prevent fluting, splitting, or collapsing during tapering. On this particular cartridge case it was necessary to soften the portion within 16 in. of the mouth considerably more than the body of the case to prevent collapsing in the taper die. This was accomplished by rotating the cases on a pedestal between two gas flames, one of which extended from the mouth of the base to a point 9 in. from the base. The other extended from the mouth to a point 15 in. lower.
Gas mixture pressure on annealing flames: 4¾ in. H_2O—90 per cent aeration on the gas.
Time in the flame: 4¾ min.
Desired hardness after annealing: See Fig. 2.

Tapering (Operation No. 22)

Press: 175 ton Bliss hydraulic press, 60 in. stroke, single action.
Average press load: 110 tons.
Diametral taper: 0.02020 in. per in.
Secondary taper: 0.0625 in. per in.
Taper die rings: 13 graduated rings of oil-hardening tool steel.

Wash and Rinse (Operation No. 23)

Same as operation No. 20.

Stress Relief Anneal (Operation No. 24)

Type of oven: Direct, gas fired recirculating.
Time in heat zone: 85 min.
Time in cooling zone: 85 min.
Temperature of oven: 535 deg. F.
The cases were stress relieved at the above time-temperature cycle to remove any residual strains set up in the previous operations without altering the grain structure of the metal.

Mouth Anneal (Operation No. 25)

The hardness requirements for the mouth of the case was such that it was necessary to anneal the section of the case from the mouth to a point 12 in. lower. This was done in a unit similar to that used for the pre-taper anneal except that the burners were shorter.
Gas mixture pressure: 4¾ in. H_2O—90 per cent aeration on the gas.
Time in flame: 95 sec.
Hardness desired after annealing: 60 to 75 Rr.

Machining (Operation No. 26)

The cases were machined in Coulter lather. The underhead diameter, flange and base facer were machined so that the case had the proper dimensional characteristics. The primer holes and counterbores were drilled and the mouth of the cases were trimmed on these lathes.

Tap Primer Hole (Operation No. 27)

The primer holes were tapped on a Haskin's tapping machine.

Final Wash and Rinse (Operation No. 28)

Same as operation No. 20.

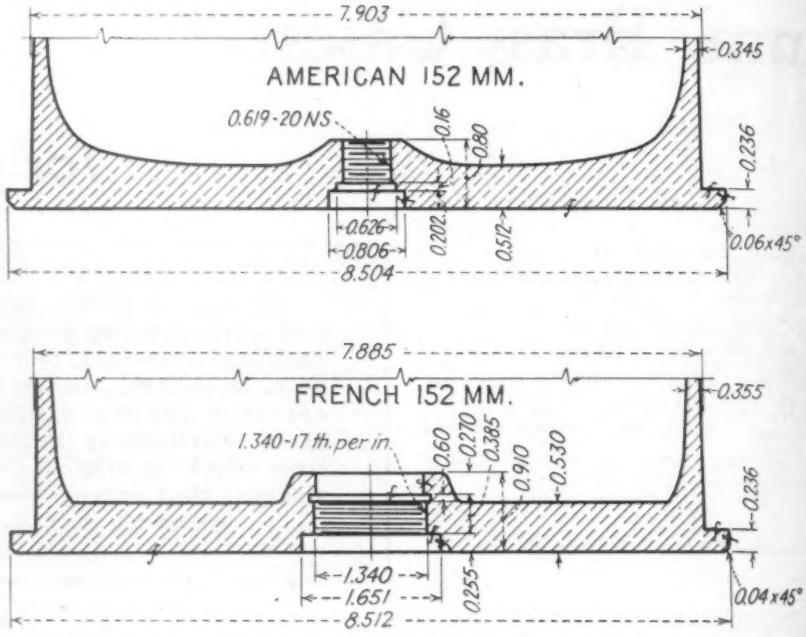

FIG. 1—Comparison of the base of the French and the American cases. Notice how the single radius on the French case intersects the base at an angle, a mechanically unsound design.

Rheem Inspection (Operation No. 29)

The cases were brought by roll conveyor into the company inspection crib where they were examined for surface condition inside and out and were gaged to determine adherence to dimensional tolerances for the following: Overall length; primer threads; primer counterbore; mouth wall thickness; head thickness; flange thickness; flange diameter; underhead diameter; mouth diameter; flange concentricity; chamber gage.

Navy Inspection (Operation No. 30)

Same as operation No. 29.

Stamp Base (Operation No. 31)

Press: 30 ton Bliss gap frame, 12 in. stroke, single action.
Each case was placed in a fixture and the base stamped with an identification in accordance with the method of marking as specified on the drawing.

Packaging (Operation No. 32)

Cases were packed in cardboard cartons, one case to each carton. Spacers were used to hold the cases firmly in the carton. There were 500 cases to each lot.

This method of manufacture proved to be very satisfactory. Production schedules were maintained with comparative ease and the scrap loss was relatively low considering the nature of the job. This is substantiated by the fact that the contract was completed in 11 days less than the allotted time and the number of pieces obtained from the disks allocated for this job exceeded by several hundred pieces the number specified in the contract.

As no specifications were available on the French case it was impossible to determine whether the cases as manufactured would meet the requirements of the gun. To clarify this situation, it was decided to draw a comparison between the sample French case and a typical case manufactured by the procedure described in this article.

The physical properties taken into consideration in this comparison were as follows:

(1) General appearance and contour; (2) chemical analysis; (3) hardness; (4) tensile strength and elongation; (5) cold shut; (6) microstructure.

Both cases were checked dimensionally before and after sectioning. The heads were cut off about 2⅛ in. above the flange and half-sectioned. Comparative dimensions on the head sections were taken and drawings made to show the differences of the inside contour of the two cases. Outside contours necessarily conformed to the dimensions of the gun chamber and breech, hence there could be little variation. (See Fig. 1.)

The bodies of the cases were sectioned longitudinally so that the differences in wall thickness could be determined. No differences outside of the normal variations due to tools and dies were detected.

As the chemical analysis has been discussed previously no further discussion will be made here.

Specification O. S. 20 requires hardness checks at several specified positions on the case. Examination of the specifications and blue prints indicated that it would be impossible to adhere to the hardness requirements as set up in O. S. 20 with the method of manufacture contemplated. The Navy Department when informed

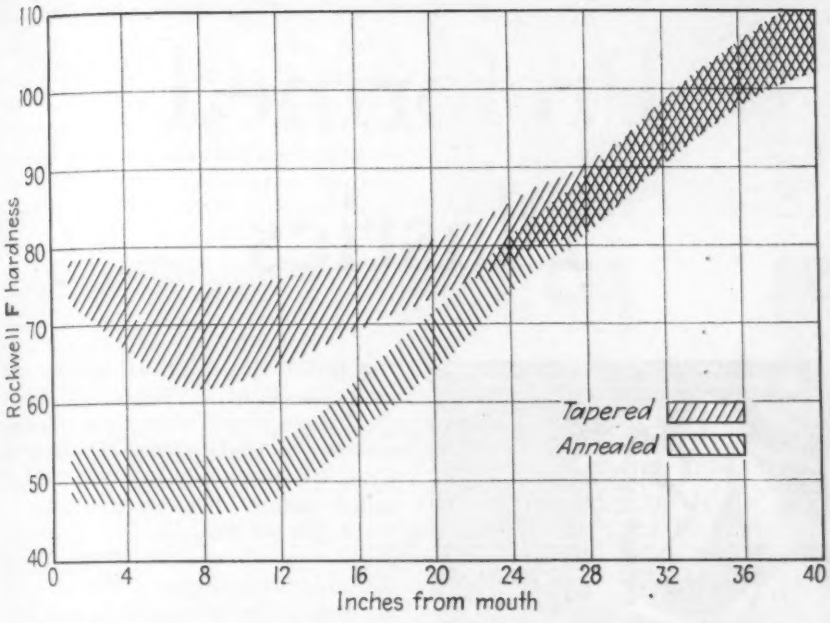

FIG. 2—Hardness range for the annealed and tapered 152 mm. cartridge cases.

of this revised the hardness specifications as follows:

6 in. from the head: 85 to 114 R_F.
6 in. from the mouth: 60 to 75 R_F.

Summary

Very little information was available concerning the method of manufacture used by the French. Microscopic examinations, however, indicate that the case was made by one of the drawing methods.

No appreciable dimensional differences were noted except those concerning the contour of the head. The American case has considerably more metal in the section where the inside wall meets the head. This is due to the long radii which join the inner wall and the head. The single radius on the French case intersects the base at an angle. This is mechanically unsound although the case may have sufficient strength to fulfill the firing requirements. The American case is constructed with a compound radii in order that the inner wall might blend with the base in a smooth sweeping curve. In the event that a choice was necessary the American design would undoubtedly prove the stronger.

The aluminum bronze from which the French case was manufactured has a higher ultimate strength, combined with increased ductility, than the 70-30 cartridge case brass of the American case. This material might possibly be stronger than an ordinary aluminum bronze due to the presence of the nickel, iron, and manganese. This alloy appears to be a modified 92-8 aluminum bronze with small additions of the previously mentioned alloying elements to give increased strength and ductility.

The 70-30 brass used in the American case has much better cold working properties than the aluminum bronze which eliminates many difficulties in processing. The strength of cold worked 70-30 brass has proved adequate for all types of cartridge cases. The hardness and tensile strength of the French case is consistently higher than the American case.

From examination of the microstructure of the French and the American case it is evident that the French manufacturers employed a material with a larger grain size. Microstructures also indicate slightly less cold working on the French case 3.3 in. and 6 in. from the head. The recrystallization 6 in. from the head on the American case is probably due to the heat from the pretaper anneal. Although there are variations in tensile strength, hardness, and microstructure, the same general characteristics are displayed in both cases. The American case follows the same general pattern as the French case with respect to physical properties. This is in accordance with the physical properties of other cartridge cases.

The ballistics tests, which constitute the final acceptance tests for the Navy, were successful.

Temperatures in Frictional Wear Tests

IN Report No. 625 of the materials committee of the Verein deutscher Eisenhüttenleute, published in the *Archiv für das Eisenhüttenwesen* of April, 1943, E. Siebel and R. Kobitzsch describe experimental work designed to measure the temperatures attained when dissimilar metals or materials are maintained in sliding friction under a high pressure up to 14,700 lb. per sq. in.

Cylindrical samples were mounted end on end in a vertical plane, and the upper one rotated at 1465 r.p.m. The relative velocity was 123 ft. per sec., and each test lasted 16 sec. The stationary sample was in all tests a low-alloy Cr-Mo steel, and the rotating upper sample various ferrous and non-ferrous metals or plastics. Temperatures were measured at the surface of the lower body with a thermocouple, and time-temperature curves were plotted.

With a copper-steel pair of samples, the temperature showed a steady rise throughout the period of each test, the maximum values being obtained with the higher pressures of contact. With a pressure of 7350 lb. per sq. in., the maximum pressure at the end of the 16 sec. was 374 deg. F.; with 8820 lb. per sq. in., 464 deg. F.; with 11,760 lb. per sq. in., 752 deg. F. after 16 sec., and with 14,700 lb. per sq. in., over 752 deg. F., already after 12 sec.

On the other hand with zinc-steel and Bakelite-steel pairs, a limiting temperature was not exceeded, the curves for the former pair having already flattened out after 6 to 8 sec., and for Bakelite and steel flattening suddenly with a sharp kink after 4 sec. At the higher pressures, the maximum temperature attained between zinc and steel was around 482 deg. F., and at all pressures with Bakelite and steel just over 572 deg. F. Also, as this limiting temperature was reached, there was a marked drop in the coefficient of friction, which with the zinc-steel pair was associated with the formation of the liquid phase, and in the case of Bakelite and steel with the decomposition of the plastic. The calculated temperature distribution indicates that the melting point or the decomposition temperature with the last pair is attained only in a thin layer on each side of the plane of contact, no wear being experienced by the steel. This temperature distribution is analyzed theoretically.

Preformed Plastics

ABOVE

FIG. 1—This liquid, gushing into a preforming dip tank consists of 99 per cent water and 1 per cent wood fibers and resin.

BELOW

FIG. 2—Hoisting the copper screen form out of plastic mixture after the vacuum pump has sucked resin impregnated wood fibers onto the form, a fillet for an airplane tail.

ABOVE

FIG. 3 — Resembling papier-mache, these preformed plastic pieces are dried and ready for molding.

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RIGHT

FIG. 4—Out of the press comes the airplane part made of preformed plastic.

ABOUT one-third as strong and one-third as heavy as aluminum alloys, preformed plastics are used to make structural parts of airplanes where buckling is a critical design factor. Preformed plastic is the result of five years of joint research by the chemists of the Westinghouse research laboratories and the Mellon Institute of Industrial Research in Pittsburgh. It is based on the art of paper making in which dispersed fibers suspended in water are felted out on screens of desired size and shape.

This plastic begins life as "stuff," a soup-like mixture of cellulose fibers (from wood pulp), water (99 per cent) and a phenolic resin, is whipped together in a machine. The resin is a special type which has an affinity for the pulp fibers, but does not tend to dissolve in the water.

In the preforming process, a fine copper gauze fashioned into the form

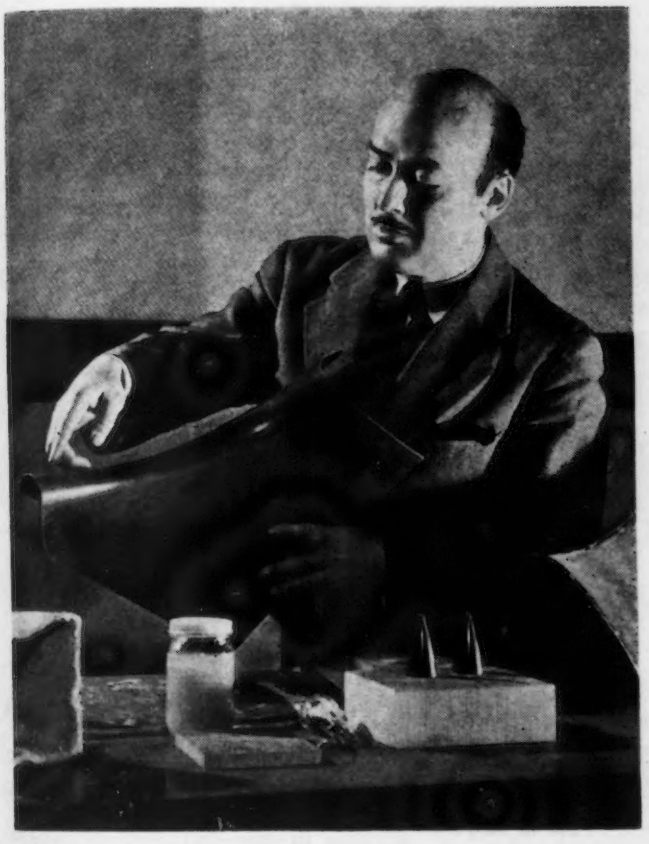
of the finished product is fitted to the end of a suction pipe and then dipped into the mixture. A vacuum pump sucks the mixture to the gauze form which permits the water to pass through the tiny holes, leaving the damp, resin-soaked fibers clinging to the screen in a uniform layer, just like the felt in a hat. Then the preformed piece is peeled off the gauze form and dried in a warm oven.

The dried piece is then placed in a heated mold and pressed into its final shape. Under this treatment, the resin melts and flows through and around each tiny fiber. By varying the time or the amount of suction during preforming, the thickness of the preformed piece can be varied, and the amount of pressure can be changed to make different varieties of plactic, ranging from a cork-like substance to a dense, strong material resembling hardwood. Inexpensive dies made of wood can be used in the press.

The accompanying table compares the strength of a preformed plastic made from Kraft pulp fiber and a simple phenolic resin.

PHYSICAL PROPERTIES OF PLASTICS

Type	Tensile Strength Lb./Sq. In.	Flexural Strength Lb./Sq. In.	Impact Strength In.-Lb.
Preformed elastic	14,000	18,500	65
Laminate (Micarta)	14,000	20,000	54
Molded (Moldarta)	7,600	10,000	36



LEFT

FIG. 5—The finished tail fillet held by Dr. A. Allan Bates, manager of the chemical and metallurgical department of the Westinghouse research laboratories.

ABOVE

FIG. 6—Preformed plastics in another application: This screen is used to make the rough form for the finished shell noses, shown in Fig. 5.

Stripping Copper Plate After Carburizing

SEVERAL methods and processes have come into general use for removing copper from steel parts that have been copper plated for selective carburization. The WPB urges that neither chromic acid nor sodium cyanide be used for this purpose because of short supplies. Because of recent developments in regard to the availability of certain salts used in preparing stripping solutions, two methods recommended by the Hanson-Van Winkle-Munning Co., Matawan, N. J., are especially timely.

1. *Copper Deplating Solution*

This is an all-potassium salt solution prepared as follows:

Copper cyanide—4.0 oz./gal.

Potassium cyanide—8.4 oz./gal.

Potassium hydroxide—2.0 oz./gal.

Potassium carbonate—5.0 oz./gal.

Operating Conditions

Temperature—180 deg. F.

Tank voltage—2-2.2 volts

Anode current density—50-60 amp./sq.ft.

Cathode-anode ratio—2:1

Free potassium cyanide—2.4-2.6 oz./gal.

Cathodes—Steel sheet or empty ball anode containers which can be periodically returned to the plating tank.

Agitation stirrer, or agitator—Mechanical motor

Tank—Steel

Time to strip 0.001 in. copper—15 min.

2. *Immersion Method Described*

The copper plated work is immersed in a solution of 1 lb./gal. of liver of sulphur, for 5 to 10 min. The articles are then rinsed and immersed in a solution of sodium cyanide (16 oz./gal.) or potassium cyanide (21 oz./gal.) for approximately 5 min. In tests with a steel panel having a 0.001 in. thickness of copper, the minimum immersion time in the liver of sulphur solution was 7 min. and in the sodium cyanide 3 min. Although the liver of sulphur solution can be operated at room temperature, sulphide formation is hastened at elevated temperatures such as 120 deg. F., if it is convenient to heat the solution.

ELECTRONICS IN REVIEW

. . . The author interprets the electronic tube as a tool comparable with tools of the trade, such as a milling cutter or a tungsten carbide bit and thus, he obliterates the vague boundary surrounding electronics. He describes electronic tube applications in terms that are part of the metal working field and presents an imposing recapitulation of the new skills and savings that these applications have made possible.

o o o

By W. D. COCKRELL
Industrial Engineering Division,
General Electric Co.

o o o

WHY all of this talk about electronics? Does it concern only the communication and navigation fields? Is it one of those things to be pigeon-holed as a long range postwar project that may bear fruit ten years from now? Or is it something that can be applied to metal working today and tomorrow?

In the first place, the electronic tube itself is a tool. As such, it compares with the milling cutter, the grinding wheel, or a tungsten carbide bit. And as such, it is no more a complete electronic equipment than the cutter or the grinding wheel is a complete machine tool. The electronic equipment used in industry is a combination of the electronic tube, the electrical components, and the mechanical parts driven by the motor or the solenoid. Each one of these three parts must function satisfactorily, or the whole equipment cannot be considered a success.

Almost all of the electronic equipment which has proven unsuccessful has failed because of lack of appreciation of the mechanical requirements of the whole equipment. Because of the extremely small amount of power required to operate the electronic tube, and the extreme speed and rapidity of its operation, far beyond anything which mechanical devices can follow, the bottleneck in the design will very often be found in the mechanical parts rather than in the electrical components. This is no reflection on the ability of the mechanical engineer. The problems to be solved with the assistance of electronic tubes are often very tough ones.

Mechanical Comparisons

What is this legendary electronic tube? It is nothing more than a one-way electrical valve. Since it acts upon the electrical current flowing as a stream of almost inertialess electrons and has no moving mechanical parts, control is obtained with a minimum amount of power, and the tube can be made to function with extreme rapidity and speed. In other words, it may be considered a completely frictionless and inertialess valve. Since in the conventional form of electronic tube only one of the elements permits the electrons to flow past a control element, the tube is also a one-way check valve. The tube may be used for rectification, amplification, or as a switch.

The action of the rectifier might be compared to that of the connecting rods and crankshaft of an internal combustion engine, which transposes the reciprocating motion of the system into the smooth rotary action of the crankshaft. Just as a number of cylinders will produce a more even flow of power, so will a multitube rectifier produce a smooth direct current without the necessity of a large electrical filter or flywheel.

The amplifier action of the tube may be considered as similar to that of any valve or servo mechanism, since by the use of a small amount of power applied at the control a much larger amount of power is released from some external power reservoir. In this respect, it must be understood that the electronic tube does not generate power.

The third function, that of switching, is also a form of amplification, but might be thought of as gate-valve action rather than needle-valve action. Most interesting is the ability of the tube to open and close an electrical circuit many millions of times without wear or noise, such as is required for the precise pulses of current used in resistance welding.

Types of Electronic Tubes

Examining the types of tubes which are available for use there is first, the phototube. The controlling element here is a beam of light. Since light energy is extremely small, the power that can be controlled is also small, but just as a small stream of water under moderate pressure can flow through a long pipe or small orifice to create a high-friction pressure drop proportional to the flow, so can the small electron flow controlled by the phototubes flow through an electrical resistance to produce a voltage drop which can be used to operate the next larger electron tube.

This next member of the electronic tube family is the pliotron, or vacuum tube. The control element is a voltage or electrical pressure. The current or electron flow requirements for control are almost negligible. Small pliotrons can be throttled from fully open to

completely closed by a voltage change of only a volt or two.

The pliotron can take the output signals from the phototube, or any other signal which can be transformed into an electrical voltage, and amplify it to sufficient power to operate a small electrical device such as a relay or solenoid, or to control one of the power electronic tubes which will be discussed next. The pliotrons have one characteristic unique among power tubes—their ability to operate many thousands or millions of time per second.

The big power tubes for industrial electronic use are the thyratrons and ignitrons. The thyratrons require very little control power, such as might be supplied by the smallest pliotrons, like those used in radio receiving sets. They are big enough to control motors up to five or ten hp.

The ignitron is the largest member of the family. Although it requires more control power (a small thyraton is usually necessary for control), it can be incorporated in equipments large enough to handle many hundreds of amperes at thousands of volts.

Tubes similar to pliotrons and thyratrons but without controlling elements act the part of rectifiers or check valves only. The vacuum tube is then called a "kenotron" and the thyratron becomes a "phanotron."

Applying the Phototube

Present day applications of the electronic tube to the metal working industry begin even before the ore is dug from the ground. In some of the largest electric shovels—large monsters that can scoop up 30 cu. yd. of material at a time—the shovel housing is leveled at the four corners by hydraulic jacks controlled by means of phototubes which watch the bubbles in two spirit levels (Fig. 1).

In the bessemer converter, a phototube, supplemented by the proper colored filters, views the flame during the converting process and stops it at the proper time for production of the best steel. In this way, it helps produce a more uniform steel.

It may be taken for granted that the phototube, in the form of a photoelectric pyrometer, will be on hand to indicate when the steel has reached the proper temperature for rolling. The presence of the hot steel before the de-scaling jets is indicated so that the high-pressure jets may be turned on only when needed. The photoelectric relay makes a good limit switch for the operation of a reversing mill, while other tubes in a precise motor control application adjust the screwing down of the roll to exact dimensions. At the end of the line, phototubes synchronize the flying shear to cut the strip into accurate lengths.

In the cold rolling process, where the thinner gages of steel are made with higher strength and finer finish, the electronic tube assists in holding proper tension between the rolls for reduction, tempering, or skin pass and at the end of the line it assists in coiling uniform, straight-sided coils.

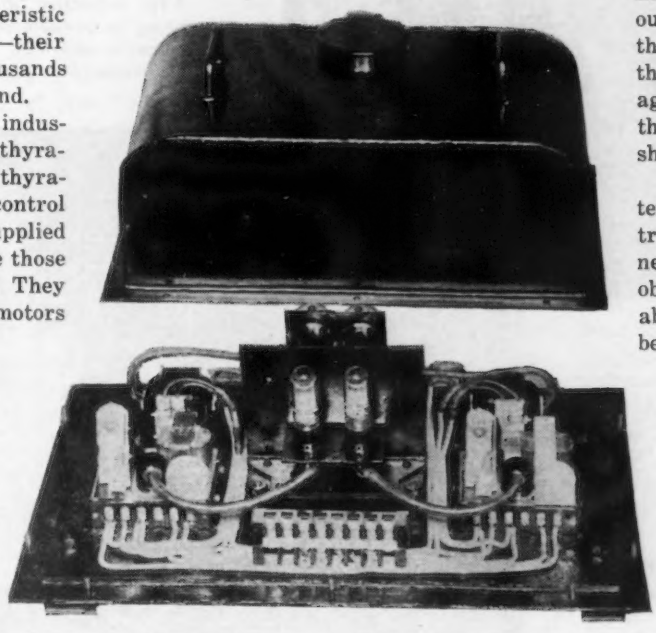


Fig. 1—A photoelectric leveling unit for large power shovels.

Controls Brightening

If the steel is tinned to prevent corrosion by the new electrolytic processes which uses less tin than the old dip method, the control of this brightening can be obtained through phototubes which watch the melting tin.

At some points in the processing of the metal strip, such as cleaning and side trimming, it is necessary to hold the strip without tension in the form of a loop. Here again, the shadow of the loop on the bank of phototubes controls the drive motors in order to keep the loop within the required limit.

Small holes in the sheet, which might permit leakage of liquids from the can into which the tinplate will ultimately be made, are detected by phototubes on the alert to "see" any small amount of light transmitted through the sheet from a bank of high-intensity lamps on the opposite side (Fig. 2).

The pinhole detection usually takes place on the shearing line, where the strip is cut up into sheets. On this same line there is usually a thickness gage, one form of which uses the photoelectric relay to indicate under and over gage. When a pinhole is detected, an electronic timing circuit permits a marker farther along the machine to be operated at exactly the proper time to mark the position of the hole. If, in addition to the pinhole, the sheets are found to be out of gage, the sheets cut from this section are diverted from the pile of prime sheets. Here, again, photoelectric relays count the number of good and bad sheets.

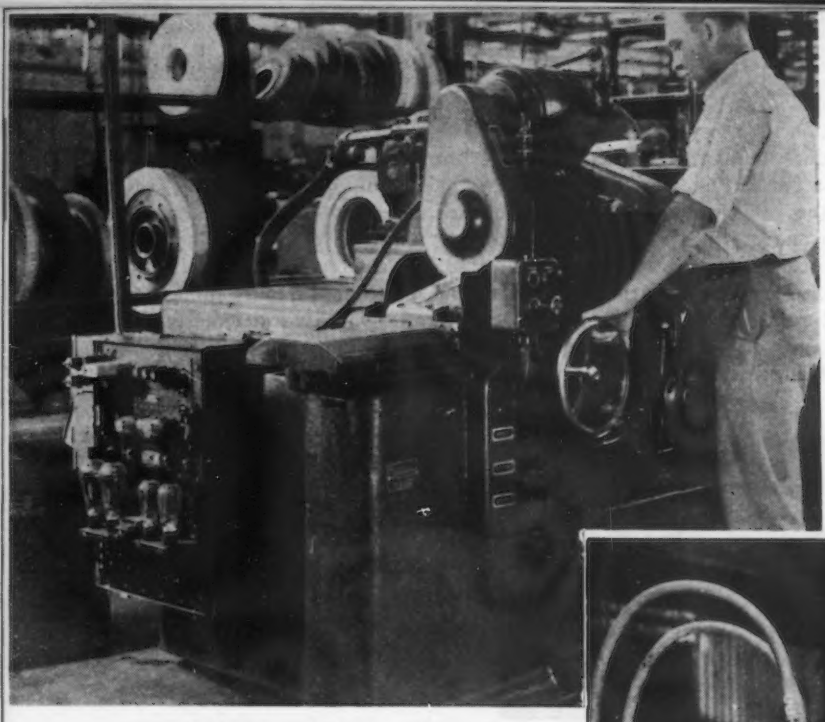
The use of phototubes for temperature indication and control is generally used in connection with visible radiation obtained at 1400 deg. F. and above. But for temperatures below this, such as are used for heat treating and other processes, tube circuits and saturable reactors are used in connection with thermocouples and indicators for precise temperature control. This permits a smooth, stepless flow of heat to the furnace, and hence more uniform heat than could be obtained where blocks of resistors are cut in and out of the heating element.

Using Paper Templates

For flame cutting, particularly when many small pieces of the same shape must be cut, there has been developed a photoelectric template follower. In this equipment, a phototube viewing a drawing in either ink or crayon on white paper replaces the expensive metal or fiberboard templates previously required for this type of work. Not only is the making of the templates greatly simplified, but storing them in sheet form is much more compact and convenient than storing the mechanical templates. Also, while the mechanical template is soon worn out, the paper templates may be reproduced photographically as many times as necessary to assure continued accuracy of reproduction.

An interesting application in one pipe mill is that of a phototube which watches the edge of the skelp with a critical eye, to insure that it holds the proper temperature as it is folded around and welded into pipe.

One ingenious application of the phototube is that used to control the removing of covers from the soaking pits, so that the desired ingots may be removed by the crane operator as



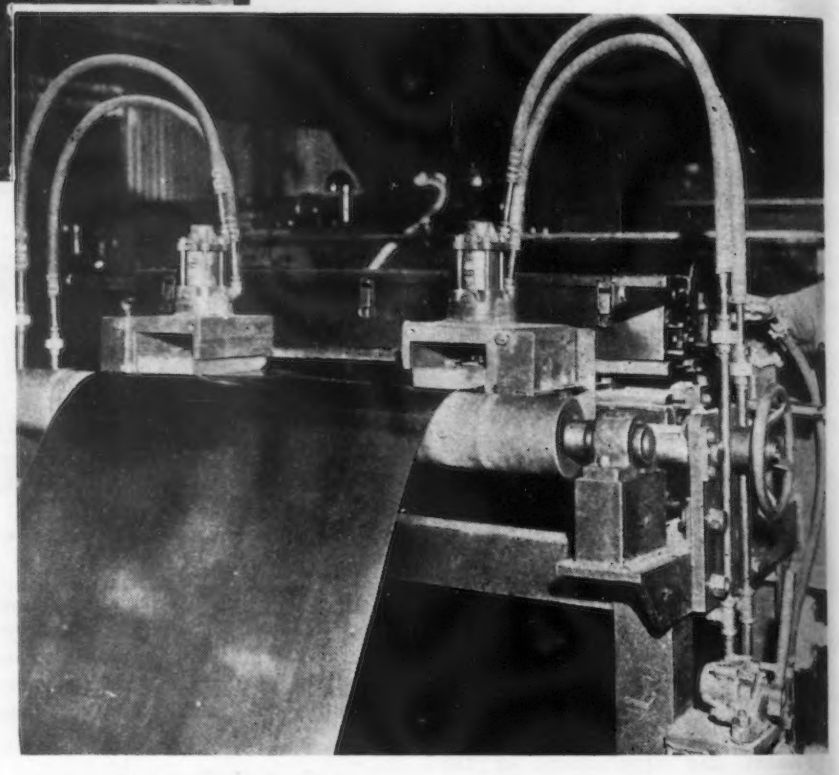
LEFT

FIG. 3—A grinder equipped with a G-E Thy-mo-trol for headstock. View showing Thy-mo-trol panel (cover removed) and a 1-hp. headstock motor, speed range 160 to 2300 r.p.m. Control station providing START-STOP and speed control shown adjacent to operator's left hand.

o o o

BELOW

FIG. 2—A G-E pin-hole detector and marking device for inspecting strip steel. View showing scanning head for pin-hole detector and supporting stand with manually operated side guides which maintain strip at proper pass line by means of air-operated pressure blocks.



needed for rolling. A photoelectric relay is mounted adjacent to each soaking pit cover and a light source is mounted on the crane cab. Whenever the operator desires to uncover a particular section of the pit, he has only to move his crane to the proper point and shine the light on the desired phototube, to start the uncovering application.

If a part is to be painted, the color of the paint can be standardized, matched, or compared by photoelectric means. During the actual painting operation, the paint spray can be started and stopped by photoelectric limit switch action. Some work has been done in the use of electro-static precipitation and electro-static fields to insure even coating and minimum loss of paint.

Motor Drive Control

For driving grinders (Fig. 3), lathes, shapers, boring mills, and the like, the electronically controlled motor offers several distinct advantages. Perhaps the most important of these is its ability to hold a preset speed quite closely despite wide changes in the torque requirements. Another is the wide speed range available with simple control. A ratio of speed of 10:1 or 20:1 is supplied as standard equipment, whereas, in some special cases, as much as 100:1, or greater, has been supplied. The limitation usually lies not in the control, but in the ability of the motor to commutate satisfactorily and to dissipate the heat losses at the extremely low speeds.

For motor control, the rectification action of the tube as well as the controlling action is used so that the advantages of d.c. motor performance may be had where only a.c. power is available. Standard ratings, 5 hp and below, are quite common, and larger sizes have been built when required.

Another very practical contribution of the tube control for motors is the easily adjustable current limiting feature. This feature limits the motor torque and current so as to prevent damage to tubes, motor, or machine. Should the machine be loaded too heavily and become completely stalled, no more than the preset torque will be applied and no damage will be done.

Welding Applications

In the resistance welding of aluminum and stainless steel, where control of power must be precise, electronic tubes perform one of three functions, and quite often all three in a single equipment. First, they must time the period of application of electric power to insure that the correct amount of heat is applied. Second, they may control the rate at which heat is applied. Finally, large ignitron tubes are generally used to switch the high power and heavy current needed for the welding.

The type of resistance weld to be made may be classified as spot, seam, or pulsation welds. Spot welds, as the name indicates, are produced by a single surge of electrical power through the joined metals. For thin-gage material, sufficient heat may be generated in one-half cycle, or 1/120th sec. Ignitrons, which may be triggered by thyratrons, switch the main circuit, whereas a small pliotron performs the timing action.

In some spot welders, timing sequence control is provided to give completely automatic functioning. For instance, there may be separate timers to regulate: (1) the squeeze time, during which air pressure is applied

to the electrodes to force the parts together; (2) the weld time, which may consist of heat, cool and total time if it is pulsation weld; (3) the hold time, during which pressure is maintained to permit the parts to chill; and finally (4) the off time, during which pressure is released from the electrode so that the part may be removed and a new part inserted.

Seam welds consist of a series of overlapping spots, made as the material moves beneath electrodes in the form of disks (Fig. 4). In addition to timing the length of time power is applied, a second electronic timer must now be used to measure the time between heat pulses.

The third type, pulsation welding, involves the use of a series of heat pulses applied to the same point. This is usually employed for the welding of heavy sections or for the welding of more than two thicknesses of metal. Electrically, the pulsation-weld control consists of a seam-weld control with a separate timer or impulse counter to count the total number of pulses to be applied.

The demand for greater amounts of power as the number or size of the sections to be spot welded have increased has resulted in a heavy, intermittent single-phase load on the power line. In some locations this cannot be permitted.

"Stored-Energy" System

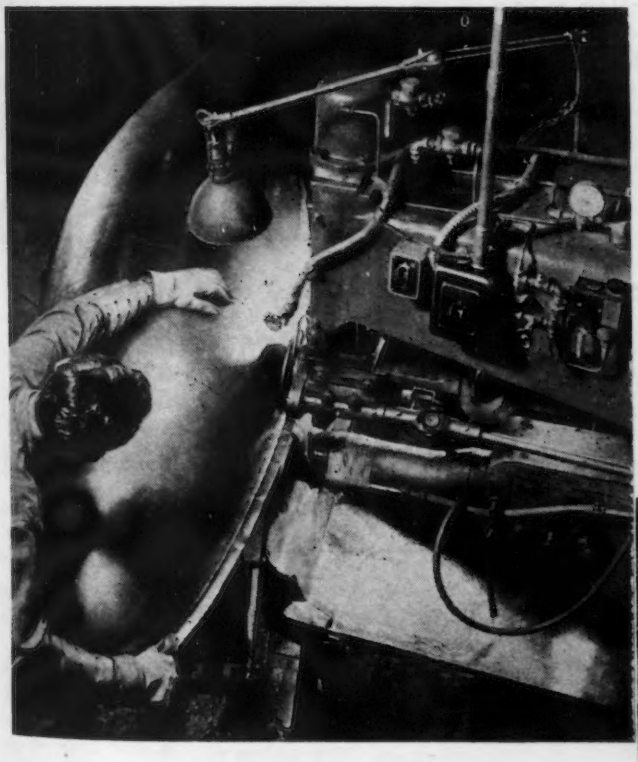
To avoid this difficulty, "stored-energy" welding systems have been employed. The energy is taken from the three-phase power-supply through a tube rectifier and stored in the form of either electrostatic or electromagnetic energy. In the electromagnectic stored energy type, d.c. current is built up in the highly inductive welding transformer primary and is then interrupted suddenly, transferring the magnetic energy into the secondary where it is applied to the weld. The second form stores up the energy in a bank of capacitors from which it is then discharged through the welding transformer. In this form both the charging and discharging functions are performed by electronic tubes.

Electronic control also assists in arc welding, particulary automatic arc welding long seams such as are common in the fabrication of large tanks or containers, or in ship construction. Using the desired arc voltage as a signal modified perhaps by the arc current desired, the electronic control feeds the welding rod at the proper rate for best welding conditions. Indeed, the "submerged-melt" type of welding, in which the arc takes place under a protective layer of flux material, would not be possible without some such means of automatic arc-length control. Atomic-hydrogen arc welding is also improved by the use of automatic electronic control of the arc voltage.

Electronic Timer

The use of the electronic timer in welding and in other cases has been mentioned, but this by no means exhausts the possibilities of this device. It has found wide use in many fields. This includes such applications as the timing of photographic printing, plastic press operations, induction heating cycles, branding, and other short heating cycles. Among the mechanical motions timed are those of grinding and buffing machines, centrifuges, mixing machines, and various laboratory tests. The greatest usefulness of the electronic timer lies in short, accurate cycles which must be repeated often.

The timing action of an electronic timer is obtained by draining off, through a resistor, the electrical potential energy stored in a capacitor until the desired tripping potential is reached. This is quite similar to the timing action which might be obtained by filling a bulb with a liquid or compressed gas, and permitting it to leak out through an orifice until the desired tripping pressure is reached. Also, the timing period may be varied easily and steplessly by a small convenient knob, such as a radio volume control, which may be located remotely at a control station, if required.



ABOVE

FIG. 4—Droppable gasoline tanks for airplanes being seam welded by an electronically controlled resistance welding machine.

o o o

RIGHT

FIG. 5—G-E 15-kw. electronic heater used for inductive heating of metal parts.

Induced Heating

A fast-growing field for high-frequency induced heating is the hardening of the surface of a metal part such as a gear or tool (Fig. 5). To heat treat a part by this method, a coil of copper tubing, water cooled, is constructed to surround the part. A current of the proper frequency then flows through this coil to induce eddy currents and heat in the work piece. The higher frequencies tend to localize the heating nearer the surface of the metal. As soon as the proper temperature has been obtained, the high-frequency power may be turned off and the part cooled by spraying jets of water from a ring surrounding the heating ring; or the part may be ejected into a cooling bath placed below the heating ring. It is evident that this is much faster than heat-treating in a furnace, and lends itself very well to production line technique.

In special cases, small brazing operations have been performed by heating the parts locally up to the brazing temperature by the use of high frequency induced heat.

Inspection and Testing

Inspection, gaging, counting, and sorting occur throughout almost all metal-working processes. The use of the photoelectric relay, particularly with the addition of simple optical systems, such as tilting mirrors, varied light vanes, and lever systems to multiply motion, lend themselves to an infinite number of gaging, counting and sorting operations, limited only by the ingenuity of the planning engineers. Gaging operations may be performed best by contact amplifiers, or electronic switches in which a feeder point in contact carries only a few millionths of an ampere to control a pliotron large enough to give a definite indication that contact has been made.

The use of the cathode ray tube and similar electronic means to compare the hysterisis loops or curves in order to match magnetic materials is becoming fairly standard. Also, photo-tubes may assist some standard tests, such as the height of the hammer bounce in the Shore scleroscope test for hardness. Somewhat more elaborate is the device which analyzes the note produced when a part is struck to determine whether the part is free from cracks or flaws.

Fatigue tests for materials are easily carried out at the natural frequency of the part by simple electronic-mechanical oscillators. Other fatigue tests, in which a constant amplitude of vibration is held on the low-frequency side of the resonant curve, are made by electronic control, which varies the speed of the driving means to hold the amplitude constant. Most of the modern balancing machines for the balancing of motor armatures, flywheels, and similar rotating parts use electronic circuits. The electronic motor control permits the testing of rotating equipment at any number of desired standard testing speeds merely by pressing the proper button.

Finally, after the devices have been completed, finish-tested, and are ready for shipping, the obiquitous phototube is there ready to assist in counting, labeling, and packaging for shipment.

Dust Removal

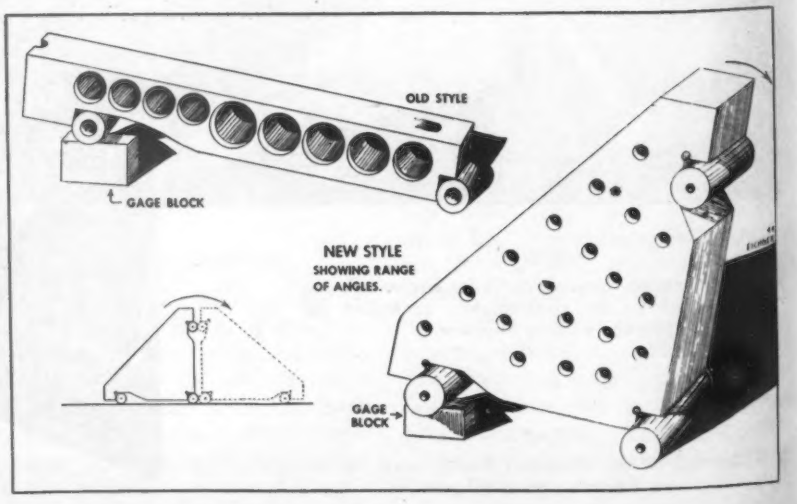
The removal of dust from the air by high-voltage obtained by electronic means is entering into competition with the more usual forms of dust collection. The precipitation of smoke in factory chimneys and the recovery of valuable by-products in smoke has long been an established practice in some industries. Incidentally, photoelectric relays placed in ventilating ducts have proved one of the fastest means of detecting smoke due to fires occuring in the area exhausted by that duct. Electrostatic removal and precipitation of oil fumes given off from certain grinding and cutting operations safeguard the health and efficiency of the workers at those machines.

These are some of the things which electronic tubes have done for the industry. They present a challenge to the reader to add new applications to the list.

Double Sine Bar Block Speeds Checking

SIMPLIFICATION of computation of angles and speeding up layout and checking work has been achieved by the use of the three-roll sine bar block illustrated. The device was suggested by an employee of the Murray Corp. of America, Detroit, and has found extensive use in the inspection department of the company.

Two conventional type sine bars are combined into one in this version, with the result that it is possible to rotate the work, with the attached double sine bar, through an angle of 90 deg. and still have two cylinders in position on which to set the gage blocks. Once the sine bar is attached to the work measurements involving several angles can be made without having to reset it in a different position. The resulting elimination of steps reduces the amount of work involved in making the angular computations.



Electroplaters Discuss Industrial Finishing Methods

. . . In this, the third and last section of a report on the 32nd annual conference of the American Electroplaters' Society, attention is directed toward hard chrome problems, electroforming by electrodeposition, internal strain in electrodeposited nickel, colored anodic coatings for aluminum, and new coatings for zinc.

THE paper awarded honorable mention among all those read at the convention of the Electroplaters' Society was "Hard Chrome Problems," by Arthur Logozzo, MacDermid, Inc., Waterbury, Conn.

Details are probably more exacting in hard chrome than any other electrodeposited medium. Consequently, problems are correspondingly greater in number: Heat treat and stress relieving; surface preparations and etching methods; the chemistry of cleaning, pickling and plating solution composition; racking and stopping-off problems; the methods of application of the electrical factors.

Many of the cracked parts taken from a hard chromium plating tank were highly stressed prior to plating. Some of these were never properly drawn when originally made, and in the case of worn parts, were subjected to repeated stress and strain resulting in fatigue failures. Platers frequently get an argument from tool men and metallurgists when mentioning application of a little heat to parts which are to be plated. Almost invariably their cry is "You will soften our metal!" They forget that chromium puts a much harder surface back on to these parts.

Following are some figures on gages, dies, punches, and machine spindles relative to hardness before and after stress relieving and also after plating. A good gage is sent out into the field with a hardness of 65 R_c scale. When it comes back to be salvaged it is heat treated at 600 deg. F. for one-half hour and the hardness comes down to 60-62. After plating, the hardness measures a Brinell of 1000 or better which is considerably harder than the original 65 R_c.

Cutting tools should be heat treated from 600 deg. to 1200 deg. F., depending on the type of steel. In many cases these tools are properly stress-relieved prior to being placed on the market but an additional treatment will not affect it and will help it.

Machine spindles are generally carburized to about 60 R_c. A 600 deg. F. one-half hour draw will bring it down to approximately 56. After building up with chromium and grinding to size the hardness will be considerably greater than the original 60 and the low co-efficient of friction of surface is thrown in to boot.

In drawing dies hardened to 63-65 R_c, a 600 deg. F. one-half hour draw will bring them to 58 to 60. A 0.001 in. to 0.002 in. plate will measure around 1000 Brinell which again is considerably harder than the original. These figures illustrate the importance of stress relieving prior to hard chrome plating.

Of the three common etches used in hard chromium, the CrO_3 at 28 oz. per gal. can be almost universally used. It can be utilized on all ferrous materials with the exception of some of the troublesome moly steels. In these extreme cases the sulfuric anodic etch is used at 25 per cent.

Adding chrome to chrome, or "adding plate" as it is more commonly called, can prove very troublesome unless a set of simple rules is followed involving the physical characteristics and the idiosyncrasies of chrome plate operation.

An anodic alkaline treatment until the surface turns slightly milky generally denotes adequate preparation of the surface. The lack of water breaks is also a reliable indicator. After rinsing treat anodically in the chromic acid etch until gassing is uniform. This must be watched carefully because a chrome plated surface does not gas uniformly when current is first applied. After this bath, place the work in the plating tank without current for 5 min. Then set voltage at 3 volts for 10 min. This is below the plating voltage and will prepare the surface for the subsequent plating. After this 10 min. period, the current is raised very slowly to the proper voltage. If the part is a large one, a longer time without current is suggested because of the importance of having the area being plated the same temperature as the bath. Otherwise, if the solution making up the cathode film is below plating temperature the first chrome deposited will be smutty. Although this will brighten up as the cathode warms up, and the subsequent plate will be bright, the smut will be there between the good deposit and the steel face, which will impair adhesion.

Condensed, the cycle is as follows:

(1) Anodic alkaline bath.
(2) Water rinse.
(3) Anodic chromic etch, until gassing uniformly.
(4) Leave in plating tank, 5 to 10 min., no current.
(5) Leave in plating tank, 5 min. at 2.5 to 3 volts.
(6) Raise voltage slowly to correct range.

There are two predominant methods of stripping hard chrome deposits, namely, the muriatic immersion dip and the anodic alkaline type. The acid strip solution as recommended

below will be found very economical and will do no undue damage to the basic metal.

30 per cent muriatic acid by volume.
1 qt. per 100 gal. solution of acid additive
Room temperature.

If the parts to be stripped are anodically cleaned prior to immersing in the acid, stripping time will be minimized. All parts should be baked at 400 deg. to 600 deg. F.

The alkaline anodic method for stripping chrome can be used if a few simple rules are followed.

18 to 20 oz. per gal. anodic alkaline cleaner
200 deg. F.
6 volts, anodically

If the concentration is checked often and maintained at 18 to 20 oz. per gal. excellent results will be obtained over a period of time.

A magnetized part, if not demagnetized prior to plating, can cause much grief. Not only does it pick up ferrous metallic particles from the various solutions, but it also gives poor adhesion. The plater should insist on having his work de-magnetized or as an alternative, set up a small demagnetizing unit in the plating room.

The formulation of a chromium solution is probably the simplest in the plating industry. Practically no break-in time is necessary. Most difficulties begin when the trivalent chromium is permitted to build up, an idiosyncrasy throwing color out of whack, producing gray, nodular deposits. This condition is particularly noticeable after a long siege of inner diameter plating where the anode is always smaller than the cathode. A simple corrective measure is to run a porous pot alongside inner diameter plating as often as possible.

Iron and copper may be dragged into a tank by any part of the cathode whether it is rack or work. This, as a rule, is negligible unless the work is made anodic in the plating tank rather than in another unit. The more iron or copper dragged into a plating bath, the higher the resistivity which means less efficiency. This type of contamination can be eliminated by heating the solution up to 160 deg. to 170 deg. F. and by using a large anode area, a small cathode and running at 3 volts either overnight or over a week-end.

Agitation will result in a faster rate of deposition, more uniformity on irregularly shaped objects and a more accurate solution temperature control.

Electroforming by Electrodeposition

"Electroforming Techniques" were described in detail in a paper by Frank K. Savage, C. G. Conn Instrument Co., Elkhart, Ind. This paper was awarded the Founder's Gold Medal as the second prize for the best papers read at the convention. Electroforming is defined as the creation of metallic articles by electrodeposition. It is found that numerous industrial applications have been made in spite of the rather general apathy and lack of specific knowledge of the subject.

Typical of the more recent developments of electroforming are processes for the manufacture of sound record masters, metal screen, electrotypes, caskets, patterns, master coin dies, dies for moulding rubber glass and plastics, duplicate intaglio printing plates, mirror reflectors, pipe fittings, seamless copper tanks, float balls for pressure gages and transformer cores. From the above examples it is readily seen that the art of galvano-plasty has evolved into the science of electroforming and industry has acquired a new engineering tool.

Electroformed articles can be generally classified in accordance with the type of metal to be deposited, the starting surface, and the surface to be finished.

The type of surface used to start the electroformed deposit depends somewhat on the design of the article to be made and can be subdivided into three general types. The first type, and by far the best, is a permanent metallic form which is a negative or mirror image of the article desired. The second type of starting surface is a fusible metal alloy having a melting point substantially less than the electroformed material. This is usually used where there is no draft and it is necessary to melt the starting material out of or away from the finished piece. The third type of starting surface, and perhaps the least desirable, is a non-metallic material such as wax which must necessarily be coated with a conductive medium; that is, a metal powder, graphite, by sputtering, or by reducing a metal salt on the surface.

The first articles electroformed at the author's plant were cornet and trumpet bells. Before bending or beading they are about 6 in. in diameter on the bell end, ½ in. to ⅞ in. in diameter on the stem end and 26 in. long. Metallic mandrels were made having the same outside dimensions as the inside of the required bells. These forms were coated with a parting medium and placed in an acid copper solution in a vertical position with the large end up. Agitation was obtained by rotating the forms and by propellers placed near the bottom of the tank. At first copper anodes were used which were later replaced by insoluble anodes. After plating to a thickness of 0.024 in. they were removed from the solution and the deposit stripped from the forms. Molded stop-off rubbers were used to block off the forms at the areas where deposits were not desired.

Later trombone bells were produced in much the same way. These bells as electroformed were 9 in. in diameter on the bell end, ¾ in. in diameter on the stem end, and 25 in. in length. These bells were also plated to a thickness of 0.024 in. and 90 deg. and 180 deg. tubular crooks were made by depositing copper over a fusible metal alloy of bismuth, cadmium, tin and lead. These forms were made by casting in steel molds. The brass or copper supporting rods through which the current was passed were cast into the blank. The fusible metal was melted out of the completed part in hot water or an oven and collected for re-use.

The excess metal which adhered to the inside of the crooks was brushed out while the parts were above the melting point of the fusible alloy. It was found that this material adhered to the parts to a much lesser degree if the castings were first given a dip in the same parting medium as was used for the permanent forms above. Where perfect removal of the fusible metal was necessary it was found that a 30 min. immersion in the following solution dissolved the excess alloy with negligible effect on the part:

1 pt., 100 volume hydrogen peroxide
1 pt., 10 per cent perchloric acid
8 pt., water
Room temperature

CAUTION: ***The temperature of the bath should not be allowed to become elevated and it should be kept free of all organic material.***

Tubing was electroformed over slightly tapered chromium plated steel mandrels. Subsequently, from these tubes, trombone slides were drawn with 100 per cent elongation. It was found that copper did not adhere well to chromium at the start of the deposition unless the chromium plated mandrels were first dipped in the parting medium.

Valve assemblies were experimentally produced in one piece complete with three valve casings and all parts and knuckles.

Probably the most interesting and most difficult development was electroformed tympani bowls or kettle drums. These varied from 25 in. to 29 in. in diameter and from 18 in. to 22

in. with a hemispherical bottom and straight sides. The conventional method of producing them was either by drawing on a hydraulic press in a series of drawing and annealing operations or by piecing them together with brazed seams, hammering the seams and spinning to final dimensions. Either of these methods involved considerable labor cost in fabricating and in the polishing and finishing operations. The final product was buffed and clear lacquered.

It was obvious that many mechanical difficulties could be eliminated if the form were made the plating tank and the deposit applied to the inside of it. The inside dimensions of this form would be the same as the outside dimensions of the finished bowl. Another advantage would be gained in finishing since the outside of the product would be the starting surface of the deposit and would be as smooth as the inside of the form. Also any flaws or scratches in the form would appear on the product as a raised spot which would be more easily removed than a depression.

A kettle drum made by conventional methods was obtained and to this an 8 in. extension was soft soldered. This extension was slightly tapered so that it was larger at the top than where it joined the kettle. The form was carefully braced with hoops and ribs on the inside and was polished on the outside to remove all scratches, pits and other flaws. The entire outside surface was coated with a parting medium. It was then fitted to a mechanism to rotate it in an acid copper solution. The prepared form was then placed in the bath and surrounded by copper anodes. After plating to a thickness of ¼ in. to ⅜ in. it was then removed from the solution and fitted with cast brass ribs on the outside which were soldered in place with low temperature soft solder to prevent distortion. The entire assembly was returned to the solution where ⅛ in. more deposit was applied over the ribs to make them an integral part of the form. The original starting sheet or kettle was then removed leaving a serviceable tank of the correct dimensions for reproducing kettle drums.

This tank was fitted with solution lines and equipped with a lead alloy grid anode of the correct shape to give uniform deposits. The anode was suspended by a shaft and rotated at 25 r.p.m. The current was introduced by a set of copper-alloy brushes contacting a copper ring attached to the anode assembly. Before each use the form was coated with a parting medium.

Techniques for electroforming have been worked out for copper, nickel, silver, iron, brass and alloys of cobalt and nickel. Inasmuch as most of the work was done with copper, the technical discussion will be limited for the most part to copper from an acid solution.

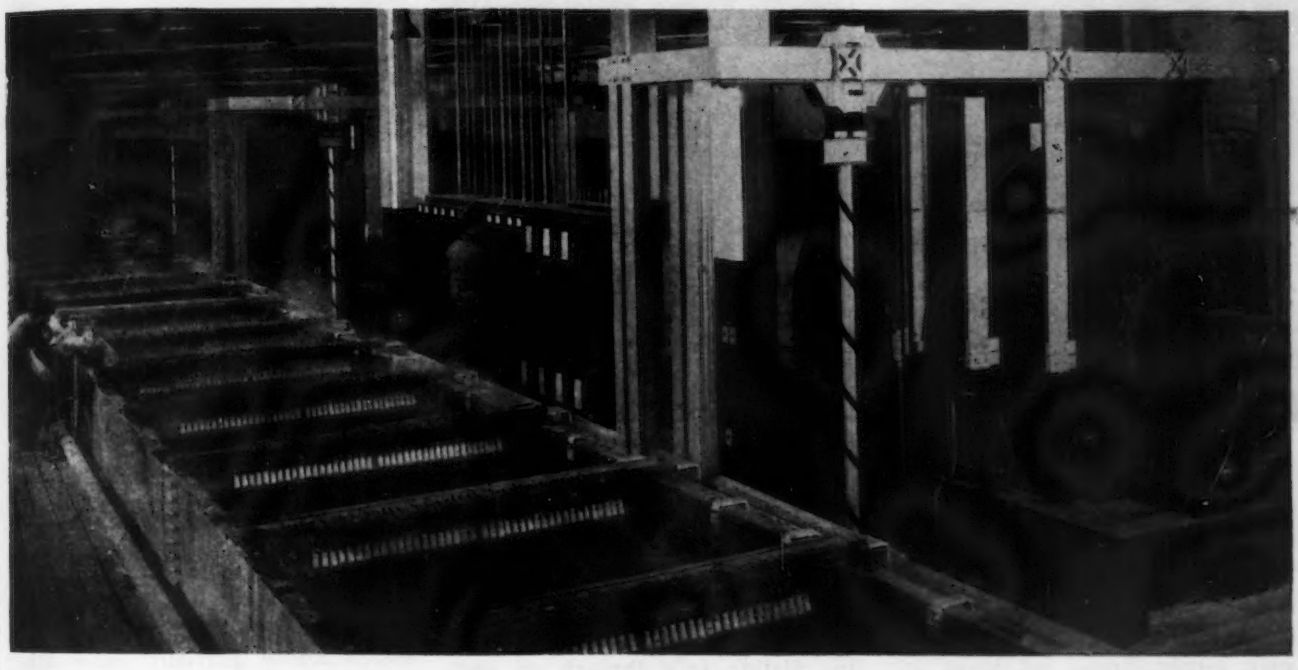
Solution Formulation

32 oz. Cu SO_4 $5H_2O$ per gal. (8 oz. Cu)
10 oz. H_2SO_4 per gal. (66 deg. Be)
0.26 oz. per gal. phenolsulphonic acid
or 1 pt. per 100 gal. molasses

As it became necessary to filter continuously with such filter aids as activated carbon and activated clay, it was found that the filter rapidly removed the grain refining properties of the breakdown products of phenolsulphonic acid and that it was necessary to make frequent large additions, leading to non-uniformity of product. Other addition agents were investigated, such as glue, casein, starch and molasses. It was found that molasses was a satisfactory addition agent to get grain refinement and its concentration was not particularly critical. Molasses was also removed to a marked degree by filtration but due to the fact that concentration tolerances were much wider this was much easier to control.

It soon became apparent that uniformity of deposit could not be maintained on work as irregularly shaped as band instrument parts unless special-shaped insoluble anodes were used. Anodes were made from 8 lb. sheet lead, 6 per cent antimony. The best anode material among those tried was a 1 per cent silver-lead alloy which had a considerably longer life than other lead alloys. The anode supports were made of a canvas or paper base low-moisture-absorption phenol-formaldehyde plastic, in special tube, rod, and sheet form.

Fortunately most of the work was



. . . Electro-galvanizing 40 strands of wire continuously in the plant of Republic Steel Corp.

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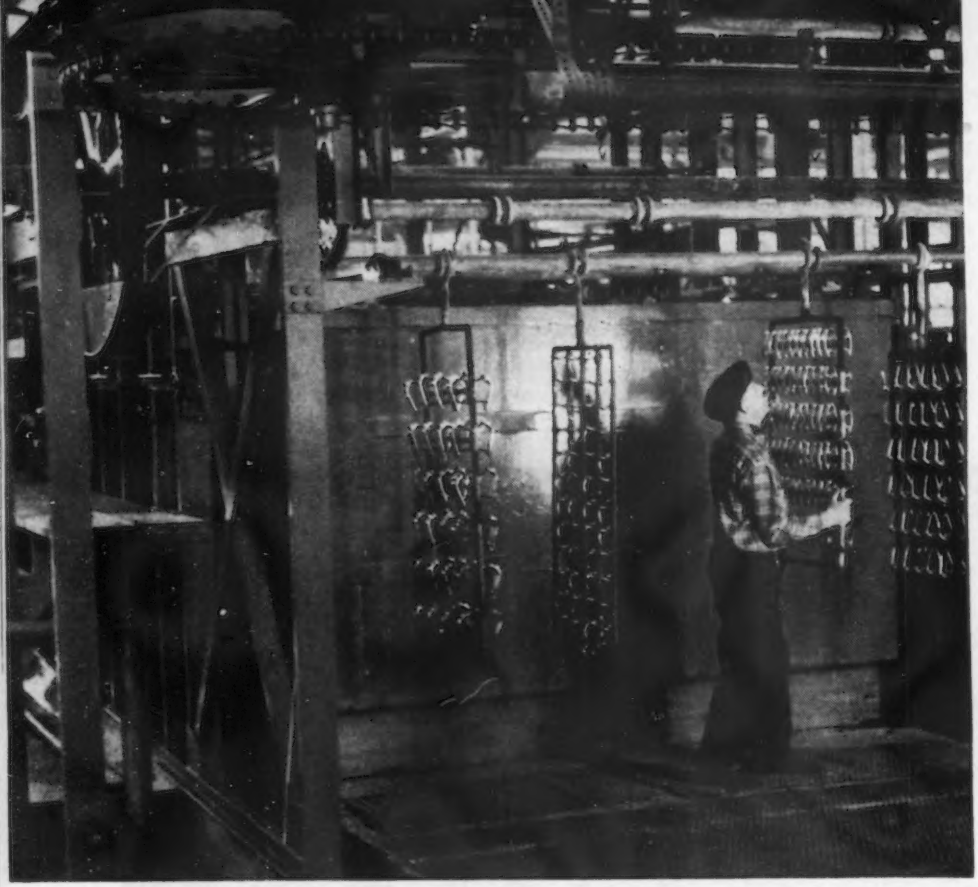


. . . Semi-automatic plating of zinc-base die castoings.

of a type which was tapered and permitted permanent metallic cathodes to be used as starting surfaces. The materials used for their construction were copper, brass, red brass and nickel silver. Little solution attack was experienced on these materials.

During loading, the forms were quite well protected by the parting medium which contained wax. The forms or mandrels were brazed to a heavily copper plated ½ in. steel stem from which they were suspended in the solution. These stems were in turn fastened to the agitation mechanism.

Some parts were made over fusible metal. In these cases the alloy used as a cathode was a proprietary alloy of the Woods metal group.

The parting medium used was formulated as follows:

Airspun graphite	3 to 4 lb.
Beeswax	1 lb.
Rosin	¼ lb.
Carbon tetrachloride	1 gal.

It was found that there was a tendency for the graphite particles to flocculate forming small lumps which caused pits in the electrodeposit. If trichlorethylene was substituted in whole or in part for the carbon tetrachloride, this flocculation was largely eliminated. Certain of the colloidal graphites on the market at the present time can be used successfully.

Rubber lined steel tanks were found to be very satisfactory. Filters were all of rubber lined steel and equipped with silicon iron fittings, valves and pumps. Solution lines of 6 per cent antimony lead were used. Solutions were returned from overflow dams in the plating cells through an open trough back to a corrosion cell. Here they were enriched in metal by the corrosion system. The solution then was picked up by the intake line of the pump, forced through the filter and delivered to the manifold line from which the plating cells were fed. Constant pressure and constant flow through the manifold line was maintained even though the flow rate through the filter fluctuated somewhat. With a constant pressure system independent of flow, the demands of each plating cell were satisfied by regulating each tank valve independently of the others.

Various electrical circuits were used in production from a standard six volt source of current. Low voltage drop rheostats were used on each individual tank to regulate the amount of current supplied. In addition a small rheostat was used on each unit in the tank to give a perfect balance of current.

Both copper-carbon and pure copper brushes were used to introduce the current to all moving electrified members in the system.

Each plating tank was equipped with an amp.-hr. meter and a circuit breaker which automatically cut out that tank when the desired thickness of deposit was obtained.

The circuit had the advantages of maximum power utilization and ease in maintaining solution balance.

The type of agitation which allowed the greatest permissible current density was a rapidly turning cathode in conjunction with mass flow of solution.

Although not often encountered, pitting in acid copper solutions was found to be very possible, particularly in heavy deposits. Dirt in the nature of non-metallics and small particles of undissolved metallic material loading on the cathode and later being removed caused pits. Both of these causes could be minimized by proper filtration and solution handling.

Gas pits were found to come from at least three sources. A rapid rise in solution temperature during the plating operation was found to throw out small bubbles of dissolved gas which became attached to even a rapidly moving cathode long enough to cause pits. A leak on the intake side filters was found to cause serious pitting. The air apparently became so finely divided in its passage through the filter pump that the bubbles were small enough to lodge on the cathodes instead of rising to the top of the solution. In cases where it was necessary to place insoluble anodes partially under cathodes, pitting was encountered, even though the cathode was rapidly rotating. It was found that the oxygen bubbles generated at the anode were sufficiently small to adhere to the cathode. This problem was solved by wrapping the anodes with strips of cloth made from vinylite material. The oxygen generated was retained close to the anode until a sufficient quantity had accumulated so that it escaped in "belches." Wrapping had to be controlled and be light if excessive anode attack were to be avoided.

All gas pitting problems were overcome or minimized by rapid solution flow against the cathode surface or by air agitation with the air jet immediately under the cathode. Air agitation tended to increase problems of solid particle pitting and roughness.

Due to the fact that most of the work was on articles where production figures were in dozens per week rather than in hundreds per day, extremely high current density work with its inherent difficulties was not necessary. The intricate shapes involved also discouraged high current densities. At moderate current densities a 24-hr. plating cycle was al-

ways adequate to get desired thickness.

The actual current density used on various products varied from 35 amp. per sq. ft. to 100 amp. per sq. ft. It was never necessary nor did it seem desirable to explore the upper current density limits although several hundred amp. per sq. ft. was possible in experimental work.

Very close metallurgical and physical specifications made it necessary to control all variables closely. Lead coils placed in the plating units and in the open trough-like solution return lines were equipped for either steam or cold water. On kettle drum units where the plating tank was also the form and where about 30 watts of energy was being dissipated per gallon of solution nearly all of the outside surface of the form was jacketed to provide sufficient cooling area.

The combination heating and cooling systems were controlled with thermostats. Motorized valves were necessary to make the operation automatic. The waste water from the cooling system was re-used in rinse tanks.

Thin Sections Encountered

In band instrument work engineers are seldom fortunate enough to work with anything resembling a flat surface or a straight line. Thickness control is at the same time very important accoustically and for strength of product. Many sections of band instruments are only 0.020 in. thick and some sections as thin as 0.010 in. In band instrument work there is rarely allowed more than 0.002 in. and hardly ever more than 0.005 in. variation in thickness away from nominal. This made anode construction and positioning very important and great care was necessary to properly center the work in the anodes. The use of individual ammeters on each cathode and ampere hour meters for each unit was absolutely necessary. The electroformed articles were individually inspected as to overall weight and the thickness was measured with micrometers, indicators and gages. One piece in 50 was split and the thickness was measured throughout the entire length with ball tipped micrometers.

In products inherently as thin as band instruments, hardness is of great importance to minimize denting. Due to the tremendous quantity of cold work necessary in fabrication, the metal must also be very ductile. This necessitated checks on hardness and grain size. The electroformed sections were metallographically examined. Hardness was usually measured by resistance to denting. Sections of standard thickness were impact tested by the pendulum method on an apparatus which was built specifically for the purpose and standards were set up for maximum deformation. Later a Rockwell superficial hardness tester was used.

In the electroforming of copper from an acid solution with insoluble anodes the problem of solution regeneration was found to be much more difficult. The most practical method was by the use of regeneration cells employing diaphragms.

Cells were set up using copper or lead cathodes placed inside unglazed porcelain cups which were filled with sulphuric acid and water. The anolyte compartment contained copper anodes and copper solutions previously depleted in metal. Upon electrolysis the copper anodes corroded normally and the shielded cathode generated hydrogen. There was almost complete "inefficiency" at the cathode. Of all the materials tried, thick, dense, unglazed porcelain was found to stop the copper migration the most efficiently. However, due to the fact that porcelain was so easily bridged through and ruined causing frequent replacement, its use was discontinued. It was found that micro-porous rubber was the most economical diaphragm material even though it did permit more copper migration.

The eventual modification of the regeneration cell was a rubber covered steel box having two 20 in. square windows in each side and a sump in each end. Over each of the windows were clamped three 1/16 in. thick sheets of micro-porous rubber. Inside the box was a large copper disc 48 in. in diameter supported by a shaft. This disk was the cathode and rotated very slowly at 1/5 r.p.m. An external scraper on each side above the solution line removed most of the copper powder which adhered to the disk. Loose particles which dropped to the bottom were periodically scraped to the sumps at the end of the box by a wiper and removed by secondary circulation through a filter. The current, about 300 amp. per box, was introduced through brushes on the large shaft which turned the disk.

On each side of the shielded cathode boxes in the regeneration cells were rubber covered steel mesh baskets in which were placed cabbaged secondary copper wire and other scrap copper including rejected work. Contact was made by inserting copper rods into the center of the cabbages.

Although this paper dealt almost exclusively with the technique of copper electroforming, similar techniques have been developed for electroforming articles and war merchandise from silver, brass, nickel and cobalt-nickel alloys.

Internal Strain in Electrodeposited Nickel

"Stress in Electrodeposition of Nickel" was the title of a paper by Bernard Martin, The McGean Chemical Co., Cleveland, Ohio.

Stress, as used in electroplating, is a term employed to describe a condition of internal strain within an electrically deposited metal. In nickel, stress may be present either as a contractive or an expansive force. The degree of stress and its direction depends upon the conditions of electrodeposition. The amount of stress that may be present in a nickel deposit has been reported by Stoney to be as high as 36,000 lb. per sq. in.

The presence of such a large force in a deposit makes itself evident in various ways depending upon the magnitude of surrounding forces. On a base such as thin steel, etc., a stressed deposit will distort or warp the base metal. Where the stressed nickel is plated on a rigid base and is unable to relieve itself by warping, it may cause the formation of cracks in the deposit. Stressed nickel, if unable to relieve itself by cracking the deposit or warping the base, attempts to overcome the force of adhesion.

The presence of stress in a deposit has a direct bearing on commercial nickel plating. In the fields of electroplating and of electroforming, a highly stressed nickel causes the warping of either lead or wax molds and may cause curling of the deposit. In steel strip plating, stress may result in warping or cracking of deposit, or alteration of stamping properties of the plated sheets. In electrorefining stress may cause shorts in the tanks by buckling cathodes or curling the deposit. In salvage work, it has been reported that stress in the heavy nickel deposits may reduce the fatigue resistance of the plated piece. Work by Speller on corrosion resistance of other metals under stress suggests the possibility that stressed nickel deposits may be less resistant to corrosion. This would be of special importance where the plate has to withstand chemical attack in industrial service.

In plating on surfaces that have a

low order of adherence such as plastics, aluminum, magnesium, etc., the degree of stress in the deposit is very important. Highly stressed nickel in decorative plating may result in poor corrosion resistance through the development of cracks. It is also likely to be the cause of seemingly adherent nickel peeling after chrome plating. In this case, the stress of chrome becomes additive to the nickel stress, and the combination is sufficient to overcome the force of adherence.

In most commercial plating the presence of stressed nickel is not readily apparent. This means that the plater has been successful in setting up forces of adherence, of tensile strength, and of rigidity which are greater than the stress in the deposit. However the strength of these forces is reduced by the amount of stress present, and if the counteractive forces are further weakened under service conditions, the stress may cause the nickel to develop hairline cracks or peel.

All of the work described in this paper was done with gray nickel solutions.

The exact cause of the development of stress in electrodeposits is as yet not fully understood. One of the theories proposed is that the strain is caused by the codeposition of hydrogen with the nickel. This theory has never been fully developed. Another theory propounded to explain the formation of strain is based on the codeposition of a hydrate. This has been investigated by J. B. O'Sullivan, who was able to detect 0.04 to 0.24 per cent of oxygen in the deposit.

An examination of the effect of operating conditions on stress seems to substantiate the hydrate theory. Conditions such as lower pH and lower cathode current density, are factors which supposedly keep hydrate formation at the cathode and its codeposition at a minimum. Under these conditions stress values secured were very near their minimum. Higher temperature, on the other hand, aids the formation of hydrates and yet is a factor in reducing stress. However, from the study of the effect of temperature on other properties of metal deposition, it appears that increasing temperatures invariably has the same effect as has lowering pH or cathode current density. Stress data follows this same pattern. In the case of nickel chloride, hydrate formation increases at a lower pH than in a sulfate bath; and again stress increases with an increase in chloride concentration. The effect on stress of those elements that form hydrates at lower pH than nickel in the nickel bath and do not as a rule readily codeposit also seems to confirm the hydrate theory. Nickel concentration, which within limits should have only a relatively slight effect on hydrate formation, has slight if any effect on stress.

We then have as possible further confirmation of the hydrate theory the effect of sodium sulphate, potassium sulphate, magnesium sulphate and ammonium sulphate. These have a tendency to suppress hydrate formation and in the case of ammonia ion the tendency is very marked. Stress data appear to confirm this. The same thing applies to the effect of the organic acids, although here we have an added feature, that of buffering. But regardless of the buffering, the difference in behavior of the individual acids seems further to confirm the stress theory.

Stress in nickel deposits may be minimized by suitable choice of operating conditions and solution composition.

Operating conditions which favor reduction in stress include low cathode current density, low pH and high bath temperature.

Chloride concentration should be comparatively low and impurities such as iron, aluminum and chromium should be absent. The addition of the sulfates of sodium, potassium, magnesium and ammonium or of formic, acetic and citric acids materially reduces stress.

Factors which, within limits, appear to have no effect on stress include concentration of nickel, concentration of boric acid and the presence of lead, copper, zinc and calcium sulphate.

New Coatings for Zinc

"Anodizing and Other New Coatings on Zinc" was a paper read by J. E. Starek, United Chromium, Inc., Waterbury, Conn.

"Anozinc" represents a development which was designed primarily to meet the need for a practical means of retarding the white corrosion products which form on zinc, especially in a salt atmosphere, and at the same time to give industry a new and useful finish applicable in many fields. More specifically, it is a type of conversion coating which is formed anodically by treating certain metals and particularly zinc or zinc plated articles in a modified chromate bath. The mechanism is similar to that used in anodizing aluminum.

Two types of Anozinc coatings are available, a yellow and a black. The yellow coating appears to be largely zinc oxide and zinc chromate with some soluble chromates absorbed from the solution. The black coating is similar except that in addition it also contains basic chromic chromate. Both coatings are extremely inert chemically and are particularly resistant to corrosion, either in the salt spray or on outdoor exposure.

The coatings are hard and have good wear resistance as compared to non-electrolytic coatings. Of particular interest is the fact that both coatings can be handled either wet or dry immediately after processsing. The coating is not fragile and can be dried, using standard methods for plated parts. Heat does not destroy the coating or produce chipping or peeling even near the melting point of zinc. Both coatings will withstand flexing, forming and drawing operations satisfactorily.

Electrically, the Anozinc coatings are not first-class conductors, nor are they as highly insulating as anodized aluminum. In this connection, tests have shown that the conductivity is sufficient for use in radio work. The contact resistance is of the order of 0.0015 to 0.003 ohm per sq. in. of contact area as compared to 0.0003 ohm for zinc. In other words, the conductivity is about one-tenth that of zinc or steel.

Anozinc solutions are prepared by dissolving the dry salts in water. The operating characteristics of each bath are given below:

Black Anozinc

	Oz. Per Gal.
Black Anozinc compound 40	30
Black Anozinc compound P41	3

	Optimum Range
pH	2.5 - 4.5
Sp. gr. (80 deg. F.)	1.14- 1.18
Baumé (80 deg. F.)	18 - 22
Temperature (deg. F.)	60 - 90
Current density (amp. per sq. ft.)	10 - 20
Time (min.)	2 - 10
Amp.-min. per sq. ft.	25 -150
Voltage	1.5 - 3

Yellow Anozinc

Yellow Anozinc compound 50 — 32 oz. per gal.

	Optimum Range
pH	5.5 - 6.0
Sp. gr. (80 deg. F.)	1.13- 1.17
Baumé (80 deg. F.)	17 -21
Temperature (deg. F.)	60 -90
Current density (amp. per sq. ft.)	5 -50
Time (min.)	1 - 5
Amp.-min. per sq. ft.	10 -50
Voltage	1.5 - 4

In general, the longer the anodizing time the thicker the coating, but on zinc plated articles, especially where only 0.0002 in. of zinc is specified, the

anodizing time must be short enough to avoid complete conversion of the zinc base plate. This normally requires an anodizing time of 3 to 5 min. at a current density of 10 to 20 amp. per sq. ft.

Control of the solution is extremely simple. No chemical analyses are required and even unskilled workmen can easily learn to operate the Anozinc solutions successfully.

Any rack suitable for zinc plating will also be satisfactory for Anozinc. Re-racking is not generally used though care should be exercised to prevent carry-over of zinc solution into the Anozinc bath or of Anozinc into the zinc bath.

The operating cycle is simple, especially if work is anodized promptly after zinc plating.

(1) Thorough rinse after zinc plating.
(2) Anozinc treatment.
(3) Water rinse.
(4) Hot water dry.

Zinc-base die castings or electroplated zinc which has become stained or dirty on standing require cleaning, by steps which are standard for cleaning zinc base die castings.

In order to get a uniform appearance on die castings in Anozinc, some form of surface finish, such as sandblasting, tumbling, polishing, wheel abrading, etching, etc., is desirable. Operation at higher current densities in the Anozinc solutions is also helpful.

Anozinc may be dried by any of the methods standard to the plating department.

Typical unsealed Anozinc coatings have a cracked structure under the microscope. While the corrosion resistance of these coatings is remarkably good, considerable work has been done on sealing treatments to see if cracking could be eliminated. If a hot dilute Anozinc solution is used for sealing the soluble chromates become fixed in the coating, and in the case of the black coating the corrosion resistance is materially increased. The yellow coating is not appreciably improved by this treatment.

The requirements for an Anozinc installation are simple; the tank is made of unlined steel, and steel cathodes are used.

The solution cost of Anozinc is about 50c. per gal., using a relatively concentrated bath, i.e., 2 lb. of dry salt per gal. Since it is unnecessary

[CONTINUED ON PAGE 128]

Continuous Induction Heat Treating

WHAT is believed to be the first production line process of high speed continuous heat treating, using Megatherm high frequency energy, has been established by the Industrial Electronics Division, Federal Telephone & Radio Corp., Newark, N. J., manufacturing associate of the International Telephone & Telegraph Corp. The application is to finished bearing pins, each 2½ in. long by ½ in. diameter, which are case hardened to a depth of 0.025 in. as they are fed automatically through a glass tube and water quenched as they leave the heating coil at the rate of 75 bearing pins per min.

High frequency induction heating is the only process known capable of this performance. Employing 5 megacycle energy, the surface of each part treated is heated above its critical temperature in less than 1 sec. Due to the high speed with which the heat is applied to the surface, there is insufficient time for it to penetrate into the core and, in consequence, only a thin surface layer experiences a change in physical state.

The factory application of this process to the continuous production line surface hardening of bearing pins involves a hopper from which the unhardened parts are fed into the glass tube; the heating coil; the Megatherm induction unit; a connection providing a continuous flow of water for quenching, and an ordinary work table carrying suitable containers for the finished and hardened product as ejected from the heating fixture.

The surface hardness developed is Rockwell C 60—above file-hardness. The metal is NE-9442 chromium molybdenum steel. The pins are finish ground prior to heat treating, and after the hardening process there is no scale or warpage. This is due to the high speed of the process, which makes possible the surface hardening of parts after finish grinding. By the elimination of much costly finishing, which heretofore has been required on hardened steel parts, large savings are effected.

o o o

CONTINUOUS case hardening of bearing pins, using a 5 megacycle Megatherm induction heating unit. Inset shows photomicrograph illustrating penetration of 0.025 in. obtained in 1 sec.

The inductor coil used in this bearing pin application is a single layer approximately 1 in. long by ¾ in. in diameter. It consists of five turns of small copper tubing which is grounded and does not carry high voltage. It is exposed to continuous wetting by the water used for quenching. There is complete safety to the operator.

The photomicrograph insert shows a highly magnified view of the hardened surface as developed on the bearing pin. The white portion is that of the hardened outside case, which extends a distance of 0.025 in. beneath the surface. Of this, there is a uniform structure for a depth of approximately 0.015 in. For the next 0.010 in., there is a slight change in the apparent structure in the material, but there is no measurable loss of hardness insofar as can be determined with carefully conducted superficial Rockwell test. The bottom portion is that of the unaffected core material. At no point in the transition zone from fully hardened case to the dark unaffected core material was there any evidence of softening or tempering of this adjacent internal layer.

Cushioning of Tipped

BY CLARENCE E. BUOTE
Chief Engineer

and

ROBERT HOLDEN
Tool Engineer
H. B. American Machine Co.
Pawtucket, R. I.

TABLE I

Test of "Cushioned" Carbide Tipped Tools Used for Rough Turning 3 In. Shot

Description of Tool				SHOT MACHINED BETWEEN GRINDS																				
Test No.	Make	Grade	Shim In.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total No. Shot	No. of Grinds	Avg. Per Grind	
1-S-1	Carboloy	78 (Rock. A 91.7)	1/64	40 (A)	113 (A)	125 (A)	190 (A)	80 (A)	150 (D)	51 (A)	180 (A)	190 (A)	46 (C)	35 (B)	75 (A)	120 (A)	96 (A)	84 (A)	154 (B)	128 (A)	88 (B)	1945	18 (1)	108	
1-S-2	Carboloy	78 (Rock. A 91.7)	1/64	51 (D)	80 (C)	75 (A)	120 (A)	100 (A)	91 (B)	103 (A)	42 (B)	151 (A)	137 (A)	64 (C)	147 (B)	98 (D)	160 (A)					1419	14 (2)	101	Avg. for both 105 for 32 gr.
2-S-1	Carboloy	78	1/32	297 (C)	190 (A)	65 (D)	70 (A)	105 (A)	259 (A)	42 (A)	98 (A)	63 (C)	100 (A)	159 (A)	91 (B)	147 (A)	123 (A)	67 (D)	152 (A)	73 (C)		2111	17 (1)	124	
2-S-2	Carboloy	78	1/32	135 (A)	92 (D)	113 (A)	65 (D)	87 (A)	92 (A)	75 (B)	106 (A)	91 (A)	89 (A)	76 (A)	157 (C)	132 (C)						1311	13 (2)	101	Avg. for both 114 for 30 gr.
3-S-1	Carboloy	78	1/16	94 (C)	120 (A)	62 (A)	56 (D)	97 (A)	68 (A)	90 (D)	40 (D)	69 (A)	110 (A)	35 (B)	62 (A)	73 (D)	91 (A)	63 (A)	24 (D)	85 (A)	120 (A)	1363	18 (1)	76	
3-S-2	Carboloy	78	1/16	125 (A)	94 (A)	82 (A)	90 (B)	89 (A)	78 (B)	100 (E)	Tool broke beyond repair—Shim apparently too thick.											658	7 (2)	94	Avg. for both 81 for 25 gr.
4-S-1	Carboloy	78 B (Rock. A 91)	1/64	36 (A)	123 (A)	45 (A)	72 (C)	40 (A)	110 (B)	65 (A)	82 (A)	93 (A)	122 (B)	133 (B)	81 (B)	73 (A)	86 (A)	94 (A)	108 (A)	106 (D)	60 (D)	1529	18 (1)	85	
4-S-2	Carboloy	78 B (Rock. A 91)	1/64	83 (A)	45 (A)	55 (A)	51 (A)	91 (A)	86 (A)	128 (B)	87 (A)	90 (A)	71 (A)	85 (A)	76 (A)	145 (B)	103 (C)	78 (A)	64 (A)	94 (A)	107 (A)	1539	18 (2)	86	Avg. for both 85 for 36 gr.
5-S-1	Carboloy	78 B	1/32	22 (A)	37 (A)	43 (A)	120 (A)	122 (A)	80 (A)	71 (A)	96 (A)	45 (B)	110 (A)	96 (A)	35 (A)	85 (B)	91 (A)	64 (A)	71 (A)	63 (A)		1241	17 (1)	73	
5-S-2	Carboloy	78 B	1/32	19 (A)	22 (A)	35 (A)	63 (A)	48 (A)	62 (A)	99 (A)	43 (B)	101 (C)	68 (A)	38 (B)	93 (A)	68 (A)	72 (A)	91 (A)	25 (E)			947	16 (2)	59	Avg. for both 66 for 33 gr.
6-S-1	Carboloy	78 B	1/16	35 (A)	35 (A)	42 (B)	78 (A)	97 (A)	45 (B)	85 (B)	92 (B)	65 (B)	42 (B)	89 (A)	42 (E)	Tool #6-S-2 with 1/16" shim averaged 65 shells for 16 gr.						747	12 (0+2)	62	Avg. for both 64 for 28 gr.
7-S-1	Carboloy	78 C (Rock. A 90.7)	1/64	50 (B)	69 (A)	100 (A)	93 (A)	40 (B)	56 (B)	72 (A)	89 (A)	67 (A)	43 (A)	62 (A)	97 (A)	100 (C)	32 (B)	61 (A)	79 (A)	98 (A)	104 (A)	1402	18	78	
8-S-1	Carboloy	78 C	1/32	25 (B)	96 (A)	125 (C)	92 (A)	63 (A)	70 (A)	32 (B)	59 (A)	115 (C)	63 (A)	35 (B)	49 (A)	45 (A)	72 (A)	32 (A)	44 (A)			1017	16	63	
9-S-1	Carboloy	78 C	1/16	19 (B)	48 (B)	72 (A)	63 (A)	92 (C)	43 (B)	61 (A)	47 (A)	68 (A)	42 (B)	59 (A)	65 (C)	42 (A)	21 (B)					742	14	53	
10-S-1	Firthite	T-04 (Rock. A 89.5)	1/64	36 (A)	50 (A)	85 (A)	65 (A)	69 (B)	70 (A)	57 (A)	86 (A)	43 (A)	73 (A)	67 (A)	59 (A)	70 (A)	89 (A)	63 (B)	45 (A)	93 (A)		1258	17	74	
11-S-2	Firthite	T-04	1/32	35 (B)	69 (A)	85 (A)	110 (C)	96 (C)	87 (C)	53 (A)	72 (C)	92 (C)	21 (B)	46 (A)	76 (A)	92 (A)	65 (A)					999	14	71	
12-S-2	Firthite	T-04	1/16	41 (B)	52 (D)	60 (A)	21 (D)	93 (A)	56 (A)	70 (A)	56 (B)	90 (A)	100 (C)	103 (E)								742	11	67	
13-S-1	Firthite	TA (Rock. A 91.5)	1/64	105 (A)	95 (A)	120 (A)	50 (B)	250 (C)	92 (A)	140 (A)	52 (B)	69 (A)	120 (A)	95 (A)	167 (A)	192 (A)	62 (B)	131 (A)				1740	15 (1)	115	
13-S-2	Firthite	TA	1/64	101 (A)	85 (A)	187 (A)	92 (B)	99 (A)	164 (C)	63 (A)	70 (A)	98 (A)	80 (A)	120 (A)	135 (A)	42 (B)	64 (A)					1400	14 (2)	100	Avg. for both 108 for 29 gr.
14-S-1	Firthite	TA	1/32	70 (B)	103 (A)	83 (B)	97 (A)	91 (A)	142 (A)	210 (A)	63 (D)	87 (A)	120 (A)	96 (A)	45 (D)	82 (A)	63 (A)	72 (A)				1424	15	95	
15-S-1	Firthite	TA	1/16	98 (A)	110 (A)	97 (A)	65 (D)	89 (A)	76 (A)	119 (A)	101 (E)											754	8	94	
T-16-1	Firthite	T-16 (Rock. A 92)	1/64	43 (A)	67 (A)	46 (A)	53 (A)	123 (B)	59 (A)	56 (B)	81 (B)	33 (A)	40 (B)	93 (B)	107 (A)	56 (A)	97 (D)	63 (A)	105 (A)			1127	16	71	
T-31-1	Firthite	T-31 (Rock. A 92.5)	1/64	43 (A)	55 (A)	27 (B)	123 (D)	86 (A)	41 (B)	52 (B)	44 (B)	89 (A)	63 (A)	100 (C)	89 (C)	40 (B)	62 (A)	115 (D)	98 (A)	89 (B)	136 (B)	1352	18	75	
Standard Firthite Tool—Grade TA				38 (A)	53 (A)	48 (B)	62 (A)	43 (B)	52 (B)	48 (A)	41 (A)	47 (A)	49 (B)	52 (B)	48 (A)	42 (A)	49 (A)	47 (B)	48 (E)			766	16 (1)	47	
Standard Firthite Tool—Grade TA				42 (A)	55 (A)	64 (C)	47 (B)	59 (A)	49 (B)	42 (C)	55 (B)	56 (A)	48 (A)	64 (B)	53 (B)	54 (A)	56 (A)	49 (A)	48 (B)	61 (C)		909	17 (2)	53	Avg. for both 50 for 33 gr

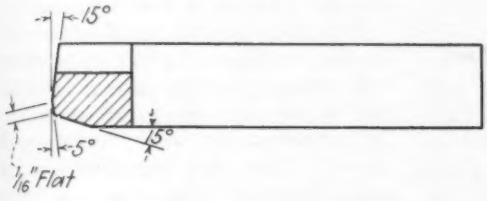
Legend for notes: (A) Small chip on tip; (B) heavy wear on tip; (C) point of tip broken off due to hard spot on shell; (D) badly broken tip, tool reground, and (E) badly broken tip, tool cannot be reground.

Note: Tests made on Lipe Carbo lathe. Spindle speed, 375 r.p.m.; corresponding peripheral speed 290 ft. per min. on 3 in. shot; feed, 0.050 in.; depth of cut, 1/8 to 3/16 in.; material SAE 4150 steel. All tools had 1 in. sq. shank.

Turning Tools ▲ ▲ ▲

. . . Extensive tests conducted in machining 75 mm. A.P. shot indicate that "cushioned" carbide tools with a copper shim under the tip have almost doubled the life between grinds as do standard tipped tools. Using a cushioned braze on tipped high speed steel dovetail form tools has eliminated breakage completely. In general it has been found that copper cushions ranging between 1/64 and 1/32 in. in thickness gave better results than greater or lesser cushions.

SINCE the introduction of carbides everyone has believed that carbide tools must have rigid tip support for ideal performance. However, about a year ago the idea was advanced that a relatively flexible cushion under the carbide tip would increase the efficiency of the tool. After considerable experimentation and tests, the conclusion was reached that the copper cushion braze as developed by General Tool & Die Co., East Orange, N. J., offered a definite advantage over the conventional method of tip brazing. These tests were conducted to determine the effectiveness of a copper cushion placed between the tip and the shank, the optimum thickness of the cushion and the best grade of carbide to use in rough turning 3 in. armor piercing shot. The data are summarized in Table I. Speed and feed given in the footnote remained unchanged throughout the tests. All tests were run on Lipe Carbo lathes.

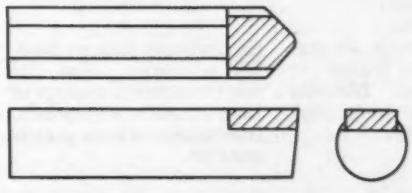


LEFT

FIG. 1—Top view of carbide tool with "artillery" grind used in rough turning 75-mm. A.P. shot.

Tests were run with tools having 1/64, 1/32 and 1/16 in. cushions under the carbide tip. Previous tests had shown that 1/64 in. was the minimum effective cushion thickness. The average performance of all the tools with 1/64 and 1/32 in. cushions indicate that the ideal cushion effect is obtainable in this range. Tools with cushions over 1/32 in. do not show any advantage over standard tools. Test No. 2-S-1, using Carboloy grade 78 tip with 1/32 in. shim shows the highest average of all the tests, namely 124 shot machined per grind, of which there were 17. Combining the results with those of test No. 2-S-2 gives an overall average of 114 shot machined for 30 grinds.

In test Nos. 13-S-1 and 13-S-2, the two Firthite tools Grade TA with 1/64 in. cushion rough turned 3140 shot in 29 grinds, an average of 108 shot per grind, while the two standards tools with the same grade tips turned only 1675 shot in 33 grinds averaging 50.5 shot per grind. This indicates an increase in efficiency over standard tipped tools of 121 per cent. When the average of 44 shot per grind obtained on 94 standard tipped tools in processing 57,909 shot (not charted) is taken into consideration the comparison is still more favorable for the cushioned tools.



ABOVE

FIG. 2—Sketch of 1/2-in. dia. carbide tipped boring tool used for contouring the i.d. of caps for 75-mm. A.P. shot.

All the rough turning tools were shaped as shown in Fig. 1 as this type grind withstands the shock of turning eccentric forgings and tip cracking is minimized.

Tool Consumption Halved

Table II shows the performance of a cushioned boring tool compared to a standard tipped tool. This tool, Fig. 2, was used for contour boring the i.d. of a cap for 75 mm. armor piercing shot. This job is unique in that the cutting speed varies from 210 ft. per min. at the start of the cut to 80 ft. per min. at the end of the cut. Before going to cushioned tools 35 to 40 tools were required per day to machine 3500 caps. After the change, tool consumption dropped to 16 to 20 tools per day. The cushion practically eliminated cracking of the tool.

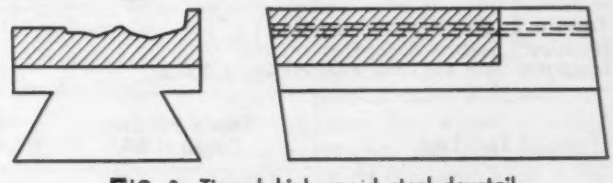


FIG. 3—Tipped high speed steel dovetail tool for rough forming band groove and finish crimping groove.

TABLE II

Test on 1/2 In. Dia. Carbide Boring Tools

Operation: Contour bore the i. d. of A. P. cap for 75 mm. A. P. shot
Machine: Lipe Carbo lathe
Material: SAE 4150 heat treated steel

Tool Type	Standard Firthite Grade TA Tool	"Cushioned" Firthite Grade TA Tool*
Spindle speed, r.p.m.	300	300
Cutting speed, ft. per min.	210 to 80	210 to 80
Feed, in. per rev.	0.030	0.030
Depth of cut, in.	3/16	3/16
Tool consumption in 24 hr.	35-40	16-20
Comments	These tools crack and chip due to heavy cut. Tool consumption due more to breakage than to wear.	Cushioned tool took the shock of cut with much less breakage. When chipping occurred it was of a finer nature and easier to grind.

* Thickness of copper cushion = 1/64 in.

These extensive tests on cushioned carbide tipped tools indicate clearly that this cushioning greatly increases the performance of carbide tools. The authors have convinced themselves that, grade for grade, the cushioned tools increase life between grinds about 100 per cent. With the cushioned design, harder grades of carbide can be used with much success because of the reduction of breakage and also of chipping, as compared with the conventional type of carbide tool.

In this connection, it should be noted that the so-called artillery grind

RIGHT

FIG. 4—Tipped high speed steel dovetail tool for finish forming the band groove with a plunge cut.

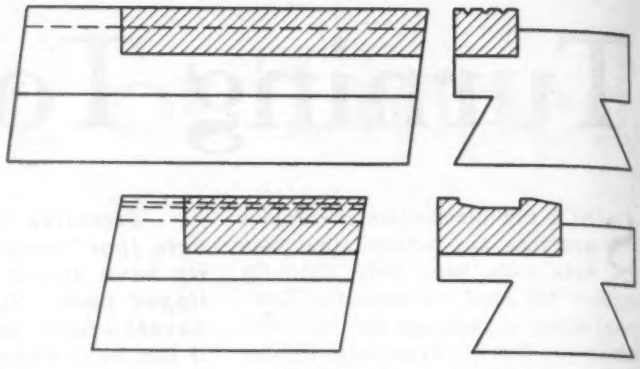


FIG. 5—Tipped high speed steel dovetail tool for finishing the copper band.

TABLE III

Tests on Tipped and Solid High Speed Steel Dovetail Form Tools Turning 75 mm. armor piercing shot

Test No. 1—Rough turn band and finish crimp groove
Machine: Stearns-Rogers-Denver No. 6.2 lathe
Material: SAE 4150 forging heat treated to 300 Br.

Tool Type	Solid 8 Per Cent Cobalt H.S.S.	"Cushioned" 8 Per Cent Cobalt H.S.S.
Spindle speed, r.p.m.	130	130
Cutting speed, ft. per min.	102	102
Feed	Hand	Hand
No. of shot machined per grind	50	125
Tool hardness	61-63 Rock. C	65-67 Rock. C
Tool breakage, per cent	40	0
Comments	Breakage through dovetail serious due to plunge cut and hand feed. Machine downtime and scrap high due to breakage.	No breakage through dovetail whatever. Tool life was increased an average of 150 per cent between grinds. Downtime and scrap greatly reduced.

Test No. 2—Finish turn band groove
Machine: Stearns-Roger-Denver lathe
Material: SAE 4150 heat treated forging, 300 Br.

Tool Type	Solid 8 Per Cent Cobalt H.S.S.	"Cushioned" 8 Per Cent Cobalt H.S.S.
Spindle speed, r.p.m.	130	130
Cutting speed, ft. per min.	102	102
Feed	Hand	Hand
No. of shot machined per grind	175	480
Tool hardness	61-63 Rock. C	65-67 Rock. C
Tool breakage, per cent	30	None
Comments	Many tools broke through dovetail due hand feed plunge cut. Machine downtime and scrap was high.	No breakage through dovetail whatever. Tool life was increased 175 per cent between grinds. Downtime and scrap greatly reduced.

Test No. 3—Finish turn copper band
Machine: Blood lathe
Material: Copper

Tool Type	Solid 8 Per Cent Cobalt H.S.S.	"Cushioned" 8 Per Cent Cobalt H.S.S.
Spindle speed, r.p.m.	800	800
Cutting speed, ft. per min.	630	630
Feed	Hand	Hand
No. of shot machined per grind	400	1000
Tool hardness	62-63 Rock. C	66-67 Rock. C
Tool breakage, per cent	17	None
Comments	Attempts were made to use a harder tool but excessive breakage took place in dovetails. Tool fed by hand at a very rapid rate.	No breakage took place in dovetail. High Rockwell hardness gave 250 per cent increase in life between grinds. Finish on copper band improved.

use for all the carbide rough turning tools for these A.P. shot has proved very successful in that this shape gave the longest possible life and the least amount of breakage.

The improvement in performance of the carbide turning and boring tools was so marked that at the suggestion of the General Tool & Die Co. experiments were begun with dovetail form tools tipped with 8 per cent cobalt high speed steel (see Table III).

On the three tools changed over an increase in tool life of 150, 175 and 250 per cent respectively was obtained. It was found possible to increase the hardness of the cushion tipped tools to 65-67 Rockwell C (as compared to 61-63 hard for the solid tool) without breakage or chipping of the cutting edge. The band groving operations on 75 mm. A.P. shot were performed in the cross slide of a Stearns Roger No. 6.2 Denver turret lathe, the back tool, Fig. 3, doing the roughing and the front tool, Fig. 4, doing the finishing. This is a plunge cut hand feed operation and tool breakage of 40 per cent for the back tool and 30 per cent for the front tool (when using solid H.S.S. tools) was entirely eliminated when using tipped tools.

The band turning operation was performed on a Blood lathe using a hand feed and the tipped tool shown in Fig. 5. On this operation production between grinds was increased 250 per cent along with a complete elimination of the 17 per cent tool breakage.

It was found on dovetail form tools the minimum thickness of cushion should be about 1/64 in. but maximum was not critical. In fact, there was no appreciable difference in performance of tools with 1/64 or 1/16 in. cushion.

In conclusion, it is felt that the cushioning of tipped tools is a subject worthy of further study and it is predicted that eventually cushioned tools will be accepted as standard.

"Welding for Postwar Construction"—*Discussion*

° ° °

By VAN RENSSELAER P. SAXE
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° ° °

THE article by the above title written by LaMotte Grover, which appeared in the June 15, 1944 issue of THE IRON AGE, is a fair statement of what can be accomplished in the structural fields by welding. Fabricators may use his ideas for the benefit of their customers and as a means for putting new competitive life in the structural fabricating industry.

Particularly interesting is the editorial notation to the "Yes, buts," and the mistaken idea that whereas welding has done such a fine job for plate fabrication it is not as easily applied to structural fabrication unless large quantities are involved.

Since 1928, the writer in his general practice has been designing welded building structures along with all other types such as wood framed, reinforced concrete and riveted steel. In this period starting with his first large welded structure, so constructed because of desire on part of owners for a low-cost form of construction for a building in which it was necessary to use structural steel, he has not found a single instance in which a welded structure could not be designed and constructed so that it would make a material cost saving compared to a similar riveted structure.

It might be fair to state that in some of the early jobs the fabricator men did some "grousing" because they were in effect developing a new process about which the boss was trying to learn something. Looking back, there was probably some ground for this on part of erection crews, who were expected to hold the structure plumb with too few erection bolts to accomplish such condition, but on the whole there was reasonable cooperation and much interest.

Today those same shops, now better acquainted with the welding process, put through a welded job as easily as the riveted work they have been doing for many more years. They do this with much less manhours of work and use of equipment; and surely with higher profits, for the prices on structural welded work have not reached the highly competitive level which exists on riveted work. Some day the prices on welded structures will become highly competitive, but it is believed from a shop standpoint that this will be compensated for by the greater volume of welded work which can be passed through the shop compared to the production time requirements of riveted work.

It is much the same as has already occurred in ship construction, where tremendous volume was made possible by the use of welding.

This thought brings up the second point of the editorial note, that the consensus of opinion was that "welding was fine for plate fabrication, but it is not so applicable to structural steel, etc."

Ship Structures Compared

In view of the large gain in welded ship construction and the known complication of connections between the parts making up a ship structure as compared with the ordinary connections required in a building structure, it is hard to understand how any fabricator familiar with each method of construction would believe that welding as used with satisfaction in a ship structure could not be used with even more satisfaction for the much more simple connections required in a building structure.

The person who thinks that way simply indicates that he has not had an opportunity or time to make a study of the simplicity of welded connections or a cost comparison between the cost of welded connections against the cost of similar riveted connections or an investigation of the various known means for making economical welded connections.

Now what does this lessened cost and the more simple methods of welding fabrication lead to, and how will the fabricating industry react to this new challenge to produce steel frame buildings at lower cost?

"New challenge" is said advisedly for one is led to think back of what the use of reinforced concrete has done to hold back the growth of the steel fabrication industry.

Well, fabricators can sit back and do nothing about it—as was the general attitude when reinforced concrete first came into use, cheering every time a reinforced concrete building collapsed (it is known there were plenty of them) and to predict that with each collapse would come a stop to the use of reinforced concrete; or they can go along with this present new-comer, welding, take advantage of the great economies it offers and get busy with this new method which will cut their costs, giving them new life and a better means to compete with their toughest competitor.

Owner Influence

The writer frankly does not pretend to know what attitude the fabricator will take, but knows that most of them are business men and those whom he knows are most earnestly seeking all possible information and not lightly just brushing the subject to one side. They know, as was the case in reinforced concrete, owners will demand the most economical structure and if they cannot get it from the structural fabricator then other sources of supply (and there are

(*Continued on Page* 146)

Radiographing Magnesium

THE physical properties of the castings, as determined from test bars poured to represent the castings, are required to be as specified in existing specifications. The test bars are cast in accordance with the form and dimensions specified, and the metal poured into test bars is given the same superheating and grain refining treatment as the metal poured into the castings, which *the test bars are to represent.* The bars are required to be cast in the same manner as the castings *without the use of chills.*

Unless otherwise specified, test bars are tested without machining, except as may be necessary to machine the ends to adapt them to the grips of the testing equipment. Where failure of a sample or specimen is definitely ascribed to faulty material *the entire lot of material represented shall be rejected.**

The general practice seems to be that the bars are sent direct from the foundry to the physical testing laboratory without attempting to determine the sub-surface continuity of the bars. The results of mechanical testing when failures occur are at times misleading, and often the bars as tested mechanically are not truly representative of the melt from which the castings are to be poured.

Any method which will offer assistance in determining the continuity of the metal should not be overlooked, and in this instance radiographic inspection is ideally suited to determine the soundness of the test bars wherein abnormally low strength is as a rule associated with shrinkage, gas blows, oxide or sand inclusions.

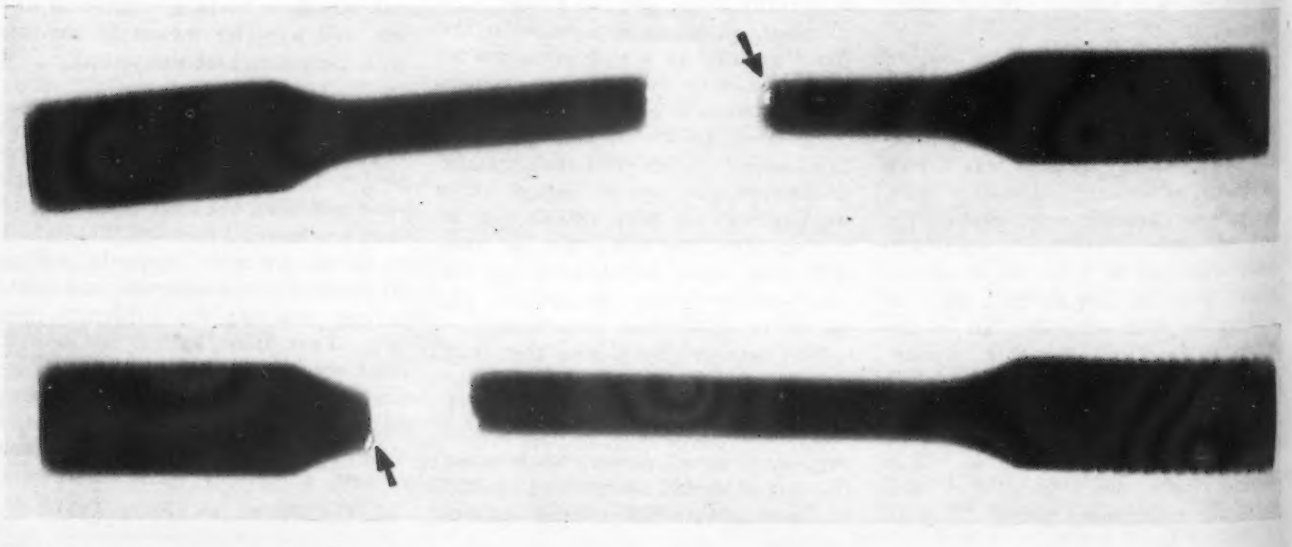
In the case of magnesium alloy test bars radiographic inspection affords a means of knowing before the physical test is applied that the bar represents sound material. Further than this, it enables a means of establishing standards upon which to base results of failure.

There would be little gained and considerable valuable time lost in mechanically testing bars which contain discontinuities, the extent of which would have a detrimental affect on the physical properties of such bars. Obviously such bars are not truly representative of the melt from which the castings will be poured. In this instance, sufficient bars should be cast to provide for radiographic inspection prior to mechanical testing. Defective bars should be scrapped and only the sound bars tested. Any defect which may occur will be the result of the casting procedure, rather than the superheating practice.

In the accompanying illustrations it will be noticed that one bar in particular contains a gross cavity. This represents a blow which may have been caused from excessive gas formation, foreign particles in the sand or by wet spots in the mold adjacent to the casting. A mechanical test performed on this particular bar would offer no representation of the properties of the castings which would be poured from the same melt. The remainder of the bars illustrated represent those in which oxide inclusions caused suspicious early failure and others sectioned for investigational purposes. The arrows indicate bars containing small oxide inclusions which may be caused by improper skimming, fluxing, gating or pouring. Their presence in the test bar does not necessarily indicate that they will be present in the castings of an identical melt where different procedures for gating, risering, chilling and pouring might well take place. Blows can be caused by excessive turbulence in the mold which takes place in pouring when the sprue and runner are improperly designed.

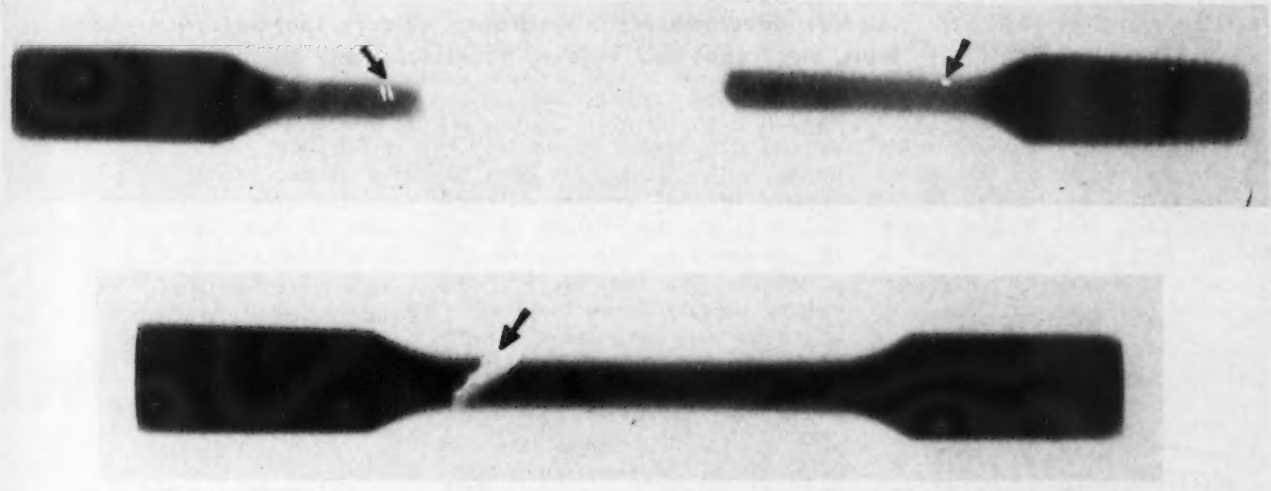
X-ray techniques chosen for magnesium alloys must be carefully studied. The low specific gravity of the

THE top test bar shows minute oxide inclusion at juncture of failure. (The similarity in density between the parent metal and the inclusion may be noted.) The bottom test bar shows rather large oxide inclusion at juncture of failure.



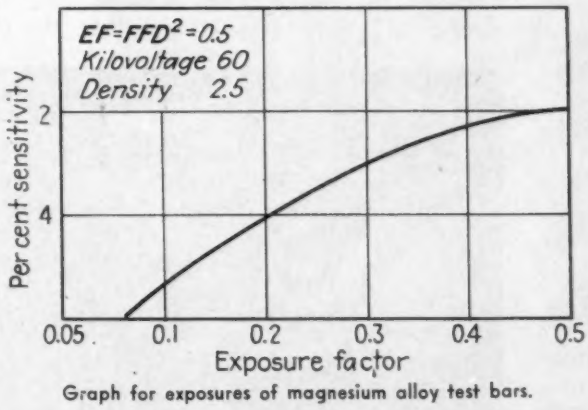
Alloy Test Bars

By ROBERT TAYLOR
Manager, Light Metal Alloy Foundry, Washington State College



RADIOGRAPHS of two magnesium alloy test bars, one containing a gross blow and the other small areas of oxide.

metal requires careful choice of kilovoltage and exposure factor in order to secure film contrast sufficient to outline the small but serious inclusions of oxide, flux and sand. Microshrinkage, perhaps the greatest offender in magnesium alloys cannot be detected with improperly chosen techniques. In addition to the careful choice of exposure factors the type of film to be used must likewise be selected with care. The finest grain film commercially available should be selected. It is also preferable that such film have a high inherent contrast characteristic as an aid in securing maximum contrast.



Graph for exposures of magnesium alloy test bars.

Whereas the topic is of a great deal more importance than the technical factors necessary to carry out the process, it might be helpful to outline a simple procedure.

As all bars cast are of equal dimension, there has been selected a standard kilovoltage of 60 kv. with an exposure factor of 0.5 of the focus-film distance squared. This provides a film density of 2.5, which when viewed by a No. 1 photoflood illuminator provides a sensitivity of 2 per cent, required for the general radiographic test.

The accompanying graph illustrates the proper exposure factor for a given sensitivity operating at a standard kilovoltage.

**Army - Navy Aeronautical Specifications, magnesium alloy sand castings, AN-QQ-M-56.*

Solventless Insulating Resin

A SOLVENTLESS impregnant for insulating coils and electrical apparatus, giving 100 per cent fill, has been produced by the Westinghouse Electric & Mfg. Co. This synthetic resin, known as Fosterite, is also a moisture-proofing material.

The solvent type varnishes which are about 50 per cent solvent cannot give more than 50 per cent fill, in other words, the dielectric strength is lowered by the inevitable voids which occur as the solvent runs out of the coil. During the impregnation of the coil or device by the new resin, the "solvent" reacts with another resin dissolved in it, and the whole mass turns to a tough solid. It is solventless in that the whole of the liquid resin reacts under heat to form the infusible solid. There are no by-products of the reaction that must escape as in most resin reactions.

The additional problem of keeping the resin from running out while it is being polymerized to a solid has also been solved. Actually, this resin is not just one resin, but a family which makes it possible to obtain a wide range of properties by suitable modifications.

The complete filling allows much

(CONTINUED ON PAGE 151)

New Equipment . . .

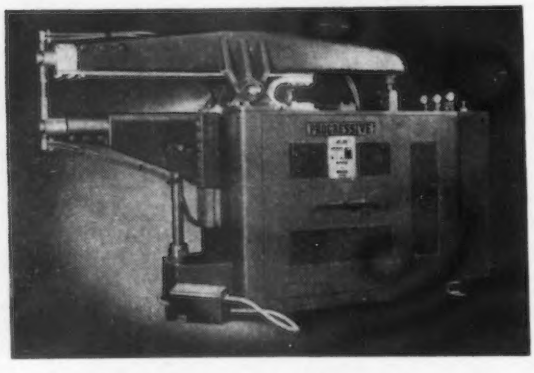
Welding

. . . New developments in resistance welders, spot and seam welder controls, electrodes and welding accessories are described in this review.

AN entirely self-contained rocker arm spot welder for production sheet metal work has been announced by *Sciaky Bros.*, 4915 W. 67th Street, Chicago 38. The upper arm is equipped with heavy duty roller bearings at the fulcrum point. The pressure cylinder contains a rubber bumper to eliminate hammering. Electronic controls and contactor are mounted in a hinged cabinet. Operation is fully automatic with controls for welding heat, duration of current, cool period and off period. Current interruption may be either magnetic or by ignitron tubes. The welder is rated 30 kva. at 50 per cent duty cycle with capacity on clean mild steel of from two thicknesses of 0.016 in. up to and including two thicknesses of 0.080 in. and on stainless steel up to a maximum of 0.040 in. plus 0.040 in. Speed on two thicknesses of 0.032 in. pickled mild steel is 180 spots per min. Electrode pressure at 24 in. throat depth is 1000 lb.

Spot Welder

THE Model C rocker arm welder, a larger companion to the Model B, designed for the spot welding of aircraft and other types of equipment of structural aluminum sections up to ⅛ in. Alclad has been announced by the *Progressive Welder Co.*, 3040 E. Outer Drive, Detroit 12. Designed for a production rate of 1000 to 2000 spots per hr. when welding heavy sections, the Model C is notable for the extreme rigidity of its construction. In the rocker arm design all deflections are thrown into the vertical plane and as a result can be used to improve the weld by providing a spring follow-up during the weld. Throat depth is adjustable from 36 to 42 in. and throat opening from 7½ to 17½ in. In addition to the normal 1 in. working stroke the rocker arm is provided with a retracting stroke to permit insertion of flanged work. Normal welding pressure is applied by depressing the foot switch. Forging pressure is applied automatically and for light pressure for tip dressing a toggle switch is thrown on the machine and the foot switch is depressed as for welding. Transformers are of the pancake type with 600 turns. A four position tap switch enables the selection of various turn ratios.



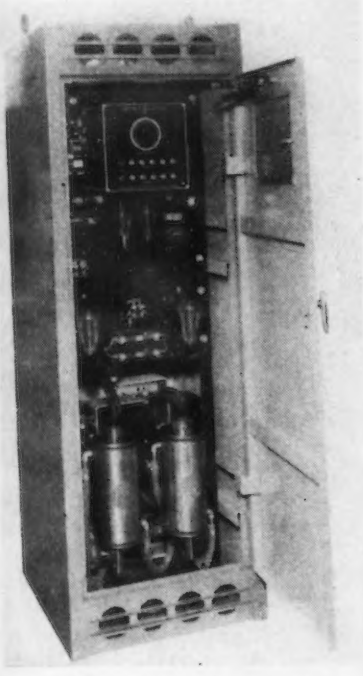
Spot Welding Timer

FOR welding small objects of high conductivity such as aluminum or copper, a new precise welding timer with heat control for timing intervals of one-half cycle or less is announced by *Westinghouse Electric & Mfg. Co.* With the SP-18 timer, the welding current is made to start at the same point on the voltage wave for every operation. The timer is furnished as a separate control for use with existing small bench welders and also in combination with a small welding transformer. Heat control is accomplished by a phase shift method, the adjustment dial for which is mounted on the cabinet door.

Tempering Attachment

A TEMPERING attachment for use with G-E synchronous spot welding controls which incorporate the phase-shift method of heat control has been announced by the *General Electric Co.* The attachment consists of a heat control and a time control adjuster for tempering, and the relays which automatically transfer the additional heat-and-time adjustment from the spot welding control with which the attachment is being used. The auxiliary control is particularly suitable for use in the spot welding of air hardenable steels, since it permits tempering the weld while the

work is still in the machine. It is enclosed in a metal case designed for wall mounting. Calibrated adjustment dials are mounted on the hinged door of this case, together with an on-off switch.

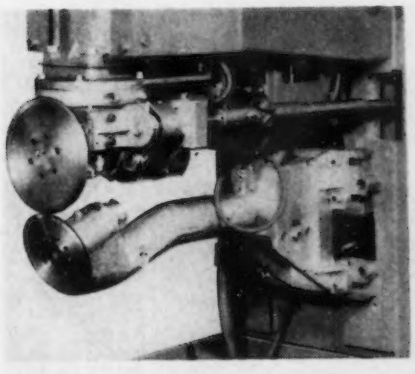


Seam Welding Control

A SEAM welding control incorporating a completely electronic timing circuit especially suitable for operations where frequent changes of the timing pattern are required such as when welding a variety of materials of various shapes and thicknesses has been announced by *General Electric Co.* Designated as type CR7503-B110, the new resistance welding control operates on a 230/460/575 volt, single phase 60 cycle power supply. The control consists of a timing panel, a firing and a heat control panel and a power panel, any one of which can be separately disconnected and removed. An electronic circuit provides accuracy of the timing pattern of the weld, regardless of normal, instantaneous or gradual line-voltage variation. Heat control is provided by the phase-shift method. The panel also contains snap switches for independent adjustment of the heat and cool time in one-cycle steps from 1 to 30 cycles. The water supply inlet and outlet fittings are on the outside of the enclosure with a row of indicating lights on the front door.

Seam Welder

A SEAM welder designed for welding close to corners of box shaped or angular assemblies has been announced by the *Thomson-Gibb Electric Welding Co.*, Lynn, Mass. The lower welding wheel is in an angular position which permits seam welds close to corner of metal boxes, ducts, etc. An angular set may be given both the upper and lower welding wheels as conditions warrant. The wheel drive shown in the welder illustrated is upper welding wheel gear driven, lower wheel idling. A variety of driving arrangements is available—gear or knurl drives may be applied to either the upper or lower wheel or to both welding wheels. This angular arrangement of the welding wheels is shown on a Thomson Model 25 seam welder equipped with double-acting air cylinder to supply the welding pressure and with variable speed drive to provide an ample range of welding speeds.

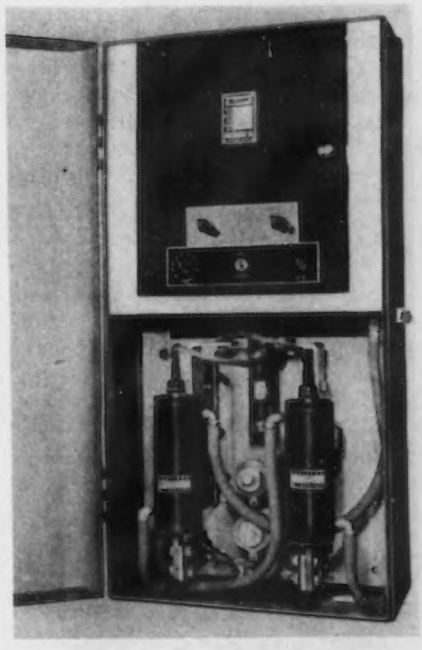


Electronic Welding Control

A VOLTAGE regulator for use with most G-E resistance welding controls that include the phase-shift method of heat control has been announced by *General Electric Co.* The control is designed to regulate the welding current automatically, so that it is held constant regardless of line-voltage variation of as much as plus 10 or minus 20 per cent. Known as the CR7503-D157, the regulator consists of a resistor circuit connected to the power line which supplies the welding machine and an electronic circuit. This electronic circuit functions not only to hold the average voltage of the resistor current constant, but also changes electronically the phase control voltages of the main welding control panel. Thus if the line voltage drops the regulator advances the phase control voltages, thereby automatically holding the welding current constant within close limit. The regulator can be used on welding circuits whose power factor is from 20 to 70 per cent and can be operated from 230/460/575 volts on a 50/60 cycle power supply. It operates whether or not the welding current is flowing which enables it to compensate for a sudden voltage drop in less than three cycles.

Weld Timer-Contactor Units

COMBINATION time-contactor "package" units designed to provide automatic, electronic control for resistance welders are announced by *Weltronic Co.*, 19500 W. 8 Mile Road, Detroit 19. The new combination units may be used with new machines or to convert manually or cam-timed welders for automatic control. A universal wall or floor mounting cabinet houses any combination of interchangeable Weltronic NEMA type timers, together with a choice of Weltronic ignitron or mechanical type contactors as required for the welder. Weltronic plug-in type control panels permit the change from any NEMA type control to another for inspection or welder conversion in less than 1 min. A single power supply unit operates all standard control panels from either 115, 230 or 460 volt a.c. lines. Synchronous timing and heating controls may be added.



Refrigeration Units

IMPROVEMENTS in the line of Frostrode industrial refrigeration units used for zero-welding and other purposes have resulted in a further increase in reserve capacity for these units according to an announcement by *Frostrode Products*, 19003 John R, Detroit 3. Improved features include an evaporator coil arrangement that eliminates all sharp bends, minimizes the back pressure of the refrigerant

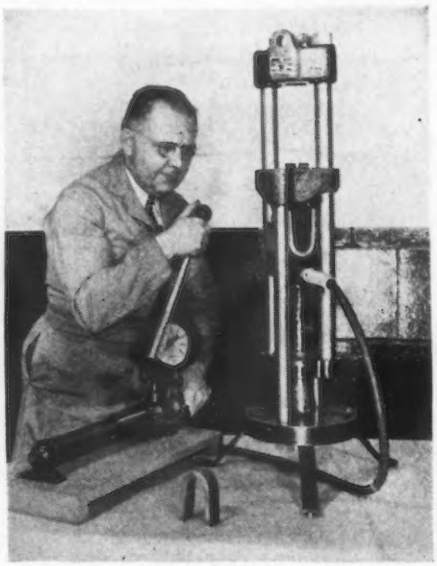
and permits unrestricted flow of the coolant. Improved expansion valves have increased the sensitivity of this unit to temperature variation. Relocation of the thermometer bulb and expansion valve near the removable inspection panel provides greater ease of inspection and maintenance. The line now comprises four basic standard units, Models 751, 1501-E, 3002 and 5001, designed to maintain 0 to 10 deg. F. coolant temperature during the continuous production runs of one, two, four and six light aluminum welders respectively or the equivalent load of steel welders or other machines. In line with governmental request to conserve the supply of Freon for critical wartime uses, all units are now designed for the use of methyl chloride refrigerant.

Aluminum Pre-Weld Cleaner

TO render aluminum surfaces chemically and metallurgically clean in preparation for spot welding, *Turco Products, Inc.*, Los Angeles, has developed Vulco-Etch, a chemical bath which frees aluminum-alloy surfaces of oxides, corrosive salts and tenacious grease and oil films. Cleaning and etching are accomplished in a 5 to 20 min. dip in the Vulco-Etch solution. Unheated wood-lined, rubber-lined or crockery tanks are used. The material rinses freely in fresh, cool running water. The solution may be used for months without change.

Metallizing Gun

A METALLIZING gun developed for the high speed production spraying of low melting point metals has been announced by the *Metallizing Engineering Co., Inc.*, 38-14 30th Street, Long Island, N. Y. Using ⅛ in. zinc, tin, lead, solder, babbitt, cadmium or fine gage copper and copper alloys, the Metco type 3E metallizing gun is said to exhibit spraying speeds which exceed any yet attained with these metals. Rates of deposition in lb. per hr. include: zinc—40, tin—70, lead—110, solder—90, babbitt—75. No gear changes are necessary to achieve these speeds and air pressure fluctuations do not affect the gun's operating efficiency. A patented controlled power unit obtains and maintains automatically any spraying speed within the prescribed range. Type 3E can be operated on any commercial gas in conjunction with oxygen and compressed air. A duplex mounting fixture is provided for permanent installation. Metco Type E guns can be converted to Type 3E and should the necessity arise, the Type 3E can be reconverted to an E or 2E.



Weld Testing Machine

A PORTABLE tensile and guided bend weld testing machine has been introduced by the *Air Reduction Sales Co.*, 60 East 42nd Street, New York 17. This machine said to be the only portable-type unit that performs the reduced section transverse section test, the guided bend test (a complete 180 deg. face or root bend) and the longitudinal all-weld metal tension test (0.505 in. specimen). The light weight of the machine enables users to perform weld tests right on the job. The machine operates on the principal of the hydraulic jack. A hand operated pump transmits pressure through a hose to the plunger. While the maximum direct load is 40,000 lb. the use of reduced section specimens permit tests on metals of 150,000 lb. per sq. in. or higher tensile strength. Jaws for making the transverse tension test and plunger and die for the guided bend test are supplied with the machine. Jaws for the longitudinal all-weld metal tension test are furnished on special order.

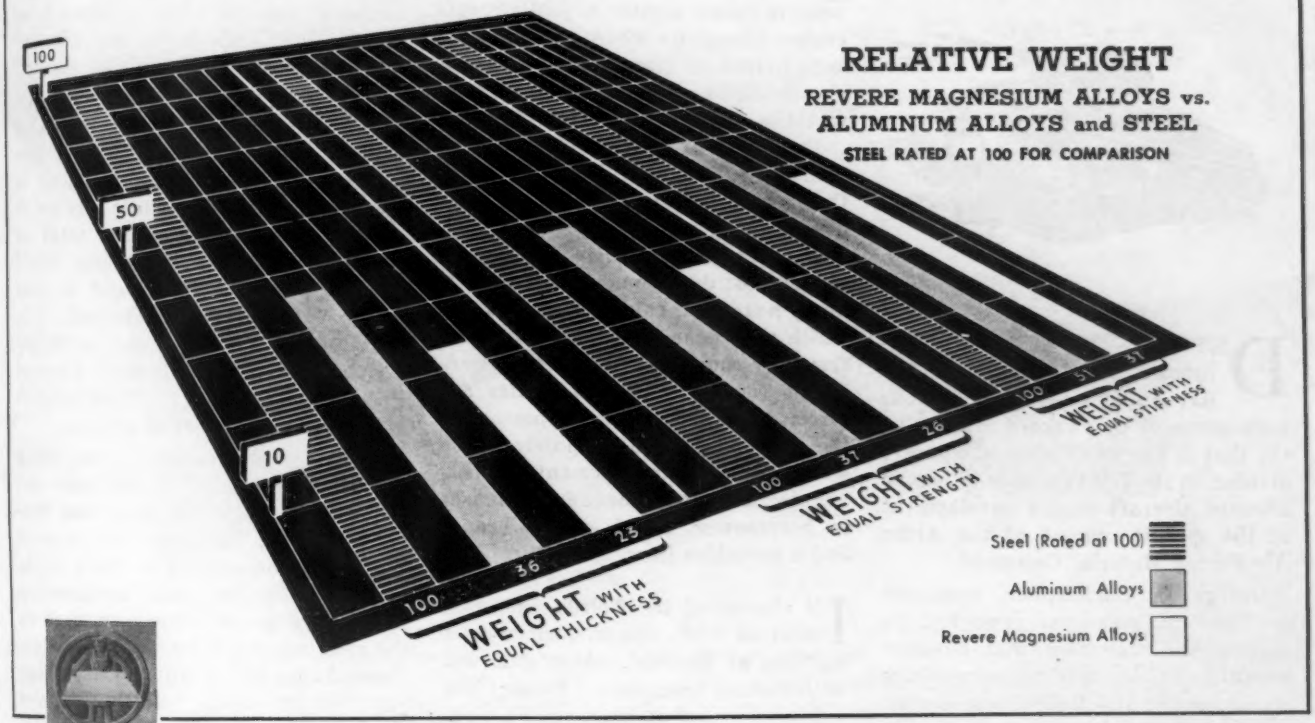
Butt Welder

A DoALL butt welder for the salvage and extension of small tools, such as steel rods, drills, screwdrivers, small grinding wheels, steel tape, wire and wire forms up to ⅜ in. in diameter has been announced by *Continental Machines Inc.*, Minneapolis 4. The butt welder also joins all band saws in widths up to 1¼ in. Completely automatic, the DoALL welder can be operated in four simple steps by unskilled help. No adjustments are necessary for different sizes saw or tool weld. An electric attachment for clamping to one of the welding jaws for the quick marking of tools and parts is available with the welder. The butt welder comes in two models, one a portable model, illustrated, and the other a pedestal type containing storage space for coiled band saw or other stock.

Aluminum-Bronze Electrode

A COATED high tensile aluminum-bronze shielded arc electrode which can be used as a filler rod in carbon arc welding has been announced by the *Wilson Welder and Metals Co.*, 60 East 42nd Street, New York 17. The Wilson No. 200 rod has its widest application in the welding of most bronzes, malleable and cast iron or steel. It can also be used for welding dissimilar metals, such as cast iron to brass, steel to malleable iron, or the joining of any two metals which are weldable with aluminum-bronze. Sizes from ⅛ to 3/16 in. in 14 in. lengths and ¼ in. in 18 in. lengths are standard stock items. Sizes from 5/16 to ½ in. in 18 in. lengths may be procured on special order.

NOW AVAILABLE } Magnesium Alloy Sheets by REVERE



THE world's largest magnesium sheet and plate mill is now in operation—by Revere. Here are produced the three alloys in demand for wartime uses:

Revere Magnesium "M" — Magnesium-Manganese alloy with moderate strength and good forming characteristics.

Revere Magnesium "FS-1"—magnesium-aluminum-zinc alloy, a general purpose metal combining high strength with good forming characteristics.

Revere Magnesium "J-1" — magnesium-aluminum zinc alloy, the highest strength sheet available.

When production exceeds war needs, Revere Magnesium Alloys will be available for use in an ever-increasing number of fields, such as automotive, household appliances, railroads. These alloys will bring revolutionary economies in weight, power, machining, production, labor. For technical assistance in planning conversion to these wondrously light magnesium-base metals, write Revere.

REVERE MAGNESIUM ALLOY SPECIFICATIONS

Grades and Tempers
h = hard rolled a = annealed
r = hot rolled

Alloys M, FS-1, and J-1 can be furnished in these tempers:

Revere M	Tempers h, a, r.
Revere FS-1	Tempers h, a, r.
Revere J-1	Tempers h, a, r.

The mill should be consulted regarding these tempers.

LIMITS OF MANUFACTURE

Sheets and Plates

Supplied from 0.020 inch and thicker in a wide range of sizes, depending upon the thickness and weight of the sheet or plate.

INDEX TO SPECIFICATIONS

Form	Revere Alloy	American Society for Testing Materials: Alloy Designation	American Society for Testing Materials: Specification No.	Society of Automotive Engineers	Aeronautical Material Specifications S. A. E.	Navy Bureau of Aeronautics: Alloy Designation	Navy Bureau of Aeronautics: Specification No.	Navy Department: Alloy Designation	Navy Department: Specification No.	U. S. Army Air Forces: Alloy Designation	U. S. Army Air Forces: Specification No.
Plate, Sheet and Strip	M	11	B90-41T	51	4370	..	..	11	47 M 2	1	11339
	FS-1	18X	B90-41T	..	....	..	..	18	47 M 2	..	11340
	J-1	8X	B90-41T	..	4380**	..	..	8	47 M 2	2	11338

**4380 annealed 4381 hard rolled

REVERE
COPPER AND BRASS INCORPORATED
MAGNESIUM-ALUMINUM DIVISION
Founded by Paul Revere in 1801
Executive Offices: 230 Park Ave., N. Y. 17, N. Y.

Assembly Line . . . STANLEY H. BRAMS

• Packard is taking on a permanent program of experimental aircraft engine production in its Toledo division . . . Truck program slips during June, particularly in heavier weight classifications.

DETROIT—One of the most significant developments of the day is the rather inconspicuous announcement by Packard Motor Car Co. that it has established a separate division in its Toledo plant "to handle advance aircraft engine development at the specific request of the Army Air Forces Material Command."

George D. Christopher, president and general manager, remarked in making the statement that developmental activities will not necessarily be confined to the Rolls-Royce engine on which Packard has extensively collaborated with British and Army engineers in important design improvements. Furthermore, this engineering outgrowth of war work need not be considered temporary, he stated.

The sum total of this announcement is that Packard, at government request, is in the airplane engine business to stay. Aircraft experimental work will be divorced completely from automobile manufacturing and will be a self-sufficient, probably profitable, and enduring program. It might be remarked that this appointment of Packard is the finest possible commentary on the way the company has done its war job in building Rolls-Royce motors.

From another standpoint, the appointment means that the government has embarked on a permanent arms program which includes not alone a standing military establishment, as in the past, but a standing program of industrial development. The government's action with respect to Packard certainly is not the sole move of its kind. Similar arrangements have likely been concluded with other aircraft engine manufacturers, and that is probably the answer to the riddle of why well-established automobile engineers have left their posts in recent months to join aircraft engine companies whose postwar outlook, judged by standards eliminating a subsidized government program, would be definitely uncertain.

Facilities of the Packard-Toledo plant, financed by Defense Plant Corp., have been increased by $1,350,000 to bring the total to $8,780,000. The operation will include propeller test stands, dynomometer test cells, a pump house and enlarged laboratories which will make the plant one of the few fully equipped engine test centers in the country. These facilities are directed toward the development, in the euphemistic and purposely vague words of the announcement, of better aircraft performance by increases in horsepower, speed and endurance and a reduction in weight.

IN charge of the Toledo operation will be C. R. Paton, former chief engineer at Packard, whose title will be directing engineer. Under him will work a staff of hand picked, highly trained engineering specialists and technicians, with peak personnel expected to total several hundred. Creative work already established at the Detroit factory by J. G. Vincent, Packard vice-president of engineering, will ultimately be transferred to the new Toledo development and creative responsibility will continue at Toledo under Vincent's supervision.

Research manufacturing at Toledo will be handled by R. R. Rees, who has been manager of the original operation. Rees' mechanical superintendent, J. P. Zimmerle, will be in charge of the actual manufacturing and assembly, teardown and re-assembly work for the program.

Toledo will also continue to operate as a manufacturing source of vital parts for Rolls-Royce engines assembled at Detroit. Output since last summer, when Packard took over the plant from Aviation Corp., totalled approximately $5,000,000 in dollar volume, and annual payroll touched the $3,500,000 mark.

On the subject of Packard it should be reported that this company's once-bleak prospects for a renewal of normal automotive production when any industry reconversion may be authorized seems to be brightening. The Toledo program—carrying the implication of possible transfer there later on of actual Rolls-Royce manufacturing—is but one phase of the picture.

Others lie in the considerably increased amount of subcontracting which Packard is doing, thus lightening the actual manufacturing load in its own plants. From last December until a few months ago, a total of 139 subcontractors had been added to the rolls. Newly placed in this category is Ranger Aircraft Co., whose own contracts began to diminish. Others of note include Chicago Pneumatic Tool Co., Allis-Chalmers Mfg. Co. and Warner & Swasey.

These subcontractors are being chosen on the basis of their size and the volume of work they can produce, whether they can use more of the latter, the quality of their work, and also whether such assignments would impinge on other war work on the auto industry. Furthermore, Continental Motors Corp., as has been reported, is taking on Rolls-Royce final assembly, and its program could also be expected to provide eventual relief for Packard.

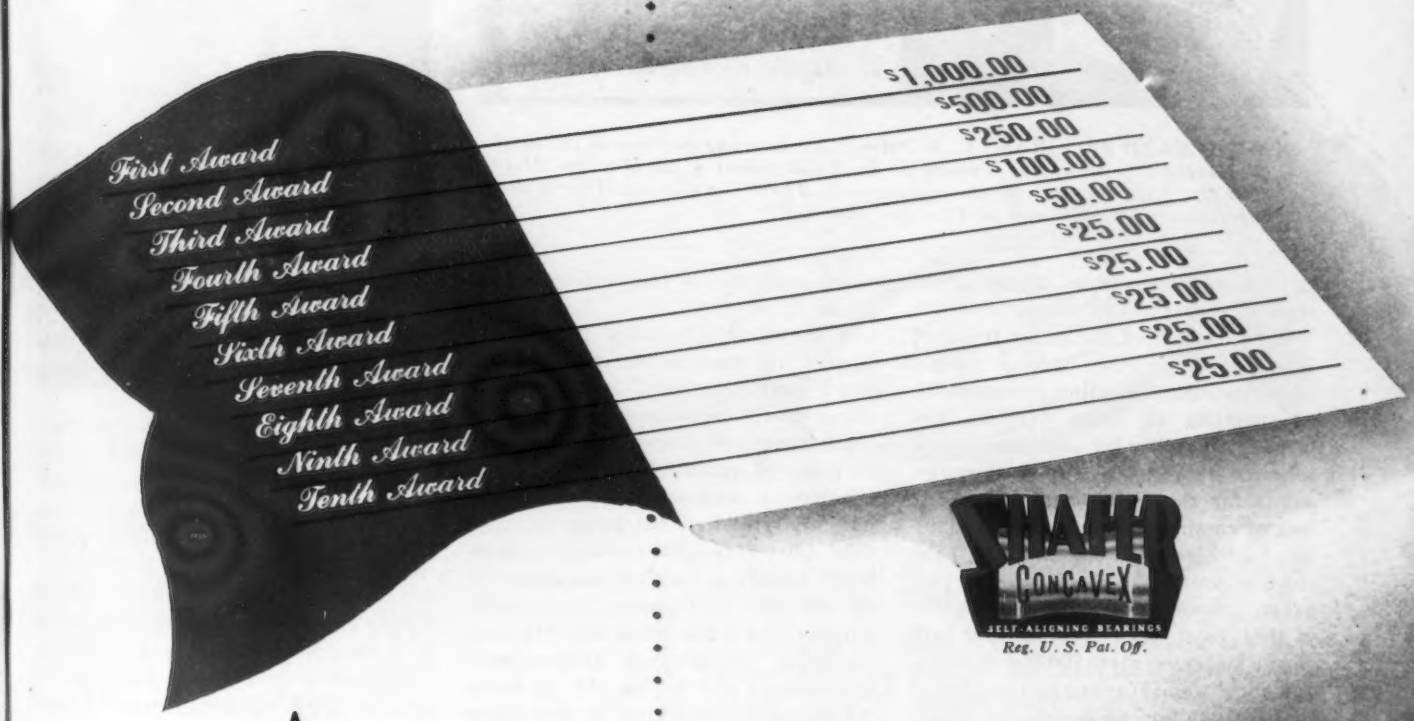
THE 1944 truck production program, barely able to hold its own during the initial months of the year, has begun to falter noticeably. Shortages of castings and forgings, previously discussed here, resulted in a one per cent decline against schedules during June, in which was included a 22 per cent drop in the heavy truck category.

The general industry outlook on forward projections is more pessimistic today. Originally, it will be recalled, approximately a million trucks were anticipated for output this year. Assignments initially made totaled around 900,000. Then the Army cut down its estimates to about 620,000, which, with 130,000 civilian assemblies, brought an aggregate of 750,000. The Army reduction was dictated by

ENTRIES FOR THE

Shafer Achievement Awards

ARE STILL OPEN

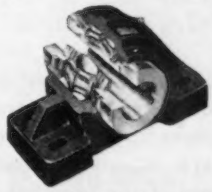


SHAFER CONCAVEX SELF-ALIGNING BEARINGS

Reg. U. S. Pat. Off.

As announced nationally in May 1944, the Shafer Achievement Awards are open to engineers, technical or practical men who may have discovered new uses for Shafer Concavex Self-Aligning Bearings or who may have had ideas for the improvement of Shafer Bearing design, manufacture, installation or service.

The Shafer Achievement Awards are prompted by the belief that the ingenuity displayed by the men who use, operate, install or service equipment which has resulted in such amazing technological progress during this war, may have been equally applied to Shafer Bearings. It is apparent that thousands more of such men have had familiar contact with Shafer Bearings during the years of this war. It is equally apparent that in the years to follow, maximum bearing efficiency and dependability will play an enormous role in securing to the new world the benefits of lower costs, of greater machine ingenuity, of greater productiveness. It is to secure such discoveries as they may apply to Shafer Bearings that the Shafer Achievement Awards have been instituted.



The Basic Shafer Idea

Shafer Concavex Self-Aligning Bearings . . . neither ball nor roller bearings . . . combine the advantages of both . . . utilizing the effective contact area of a ball many times its size . . . yet eliminating such a ball's ineffective mass. Automatic self-alignment, high radial load capacity, superior shock resistance and long life result.

All suggestions and ideas will be judged by the following authorities:

JOHN J. SCHOMMER, Professor of Industrial Chemistry, Illinois Institute of Technology. Nationally recognized authority on industrial processes and engineering design.

PHILLIP C. HUNTLEY, Formerly head of Mechanical Engineering Department, now Head of Civil Engineering Department, Illinois Institute of Technology. Widely known engineering consultant.

CHARLES A. NASH, Associate Professor Electrical Engineering, Illinois Institute of Technology. An Authority of broad practical experience in Electrical and Mechanical Engineering.

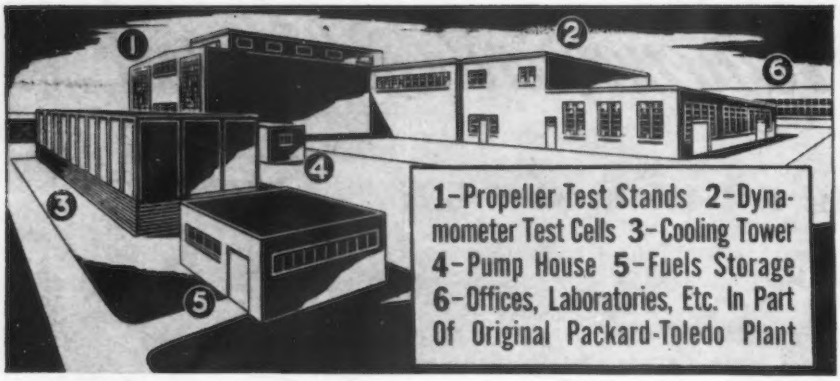
ARTHUR H. WILLIAMS, Vice-President, in charge of Engineering, Shafer Bearing Corporation.

Awards as stated above will be made on the basis of the merit in whatever ideas are submitted as valuable contributions to the art of design, manufacture, application or use of Shafer Self-Aligning Bearings. The opinion of the judges will alone determine the relative merits of any ideas submitted and all decisions of the judges will be final. In the event of any ties, identical or duplicate awards will be made. The Shafer Bearing Corporation reserves the right to adopt or make use of any ideas submitted.

Address all entries to the Shafer Achievement Awards Committee

Shafer Bearing Corporation

1422 W. Washington Blvd., Chicago 7, Illinois


1-Propeller Test Stands 2-Dynamometer Test Cells 3-Cooling Tower
4-Pump House 5-Fuels Storage
6-Offices, Laboratories, Etc. In Part Of Original Packard-Toledo Plant

NEW PACKARD PROGRAM: *C. R. Paton (→), directing engineer of the newly developed aircraft engine division in the Toledo plant of the Packard Motor Car Co., discusses plans for the new division. Above is a drawing of the Toledo operation after additional facilities are installed.*

the simple necessity of adjusting desires to actual availabilities.

A good share of the Army program is clustered in the heavier weight classifications, including unprecedented quantity of 5-ton vehicles and larger. Inability of axle and transmission sources to supply requirements for this class, not only due to lack of castings but to lack of machining facilities as well, casts a bleak shadow over that phase of the program. Accordingly, current feeling is that total 1944 truck output will run to no more than 700,000 vehicles, and some well-informed sources figure that 600,000 will be nearer the actual final figure. Of course medium and lighter weight trucks will also fail to reach schedules if the decline is that great.

Even if the foundry problem is cleared in time to increase sagging third quarter output, another stumbling block remains. Heavy duty truck tires are simply not to be had in required quantities. Akron circles reported a cutback in the current monthly directive for large castings from 140,000 to 60,000 units, the cause being mainly a lack of manpower to do the job. It becomes increasingly obvious that if the truck industry does surmount its axle and transmission problems, it will not be able to equip its assemblies with tires as they come off the assembly lines in originally anticipated volume.

Disposal of Idle Steel Authorized

Washington

• • • **In a recent letter** to all steel distributers, Norman W. Foy, WPB Steel Division Director, pointed out that Direction 44 to CMP Regulation No. 1, issued Jan. 22, authorizes distributers having off-grade or rejected steel or idle or excess inventory that they are unable to move under CMP regulation, to apply to WPB for permission to dispose of such material.

Each application must be submitted in duplicate, Mr. Foy said, and must contain the following information: (1) name of prospective customer, (2) product to be made, (3) description and location of the material, (4) length of time the material was held, and (5) the reason why the holder was unable to move it under CMP regulations.

The letter is not to be construed as a relaxation in the use of steel, Mr. Foy stressed. It is simply a measure to help distributers dispose of steel they have accumulated in warehouses and for which there has been no CMP demand. No appreciable tonnage is involved, Mr. Foy said.

Material otherwise unsalable is permitted to move from warehouse to users approved by WPB, even though these users do not have allotments. The end use of the products, however, must satisfy conditions of WPB, and deliveries approved must not be used to support stock replacement orders, Mr. Foy explained.

WPB will consider application from distributers for permission to dispose of any steel in their stock, regardless of the source from which it was purchased, it was pointed out by officials. Applicants were warned, however, that granting of their requests will mean foregoing replacement in their stocks of the tonnage involved.

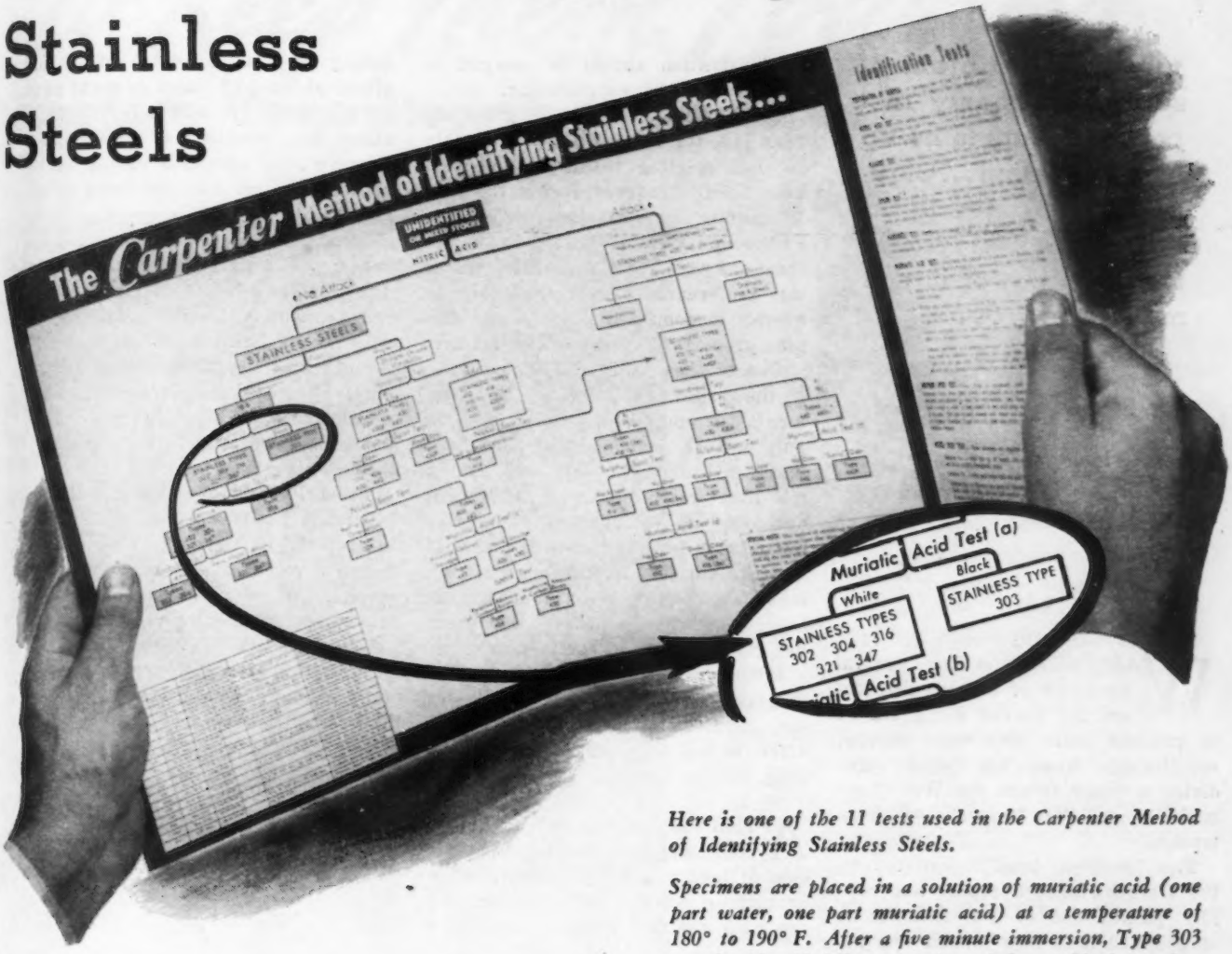
Mr. Foy's letter pointed out that Paragraph (c) (1) of both Order M-21-b-1 and Order M-21-b-2, which became effective July 15, declare that any delivery authorized by WPB Under Direction 44 is non-replaceable in a distributer's stock.

Deliveries from stock pursuant to specific WPB authority under Direction 44 must be classified separately by product groups, Mr. Foy said. Forms WPB-2888 and WPB-2892 will be revised for the third-quarter report to show the tonnage of steel sold "ex-allotment" in each product group.

No applications for domestic cases will be considered unless the steel offered for sale has been in the warehouse longer than 60 days, Mr. Foy said. If end-users intend to produce restricted or prohibited products, distributers must attach a copy of the specific authority issued by WPB to the customer seeking relief from the limitation order in question. Steel offered for export under Direction 44 must have been on hand for more than 120 days before such applications will be considered, Mr. Foy pointed out.

Applications for domestic cases should be directed to the Warehouse Branch, WPB Steel Division, Room 1528B, Social Security Building, Washington 25. Export cases, dealing with materials stored in warehouses longer than 120 days, must be sent to the WPB via the exporter, and not direct to the Warehouse Branch.

To Help You Identify Stainless Steels



Here is one of the 11 tests used in the Carpenter Method of Identifying Stainless Steels.

Specimens are placed in a solution of muriatic acid (one part water, one part muriatic acid) at a temperature of 180° to 190° F. After a five minute immersion, Type 303 can be identified by a coating of heavy black smudge.

Even in the best regulated plants, steel stocks sometimes do get mixed. And if the stock happens to be Stainless Steel, you know the troubles a mix-up can cause in heat treating, machining, stamping, welding or other fabricating operations. So it's important to you to have a quick method for identifying Stainless that may become mixed in stock.

To help you meet this problem, the Carpenter Laboratories have developed a new and simplified chart for identifying various types of Stainless Steel. The chart diagrams and explains the nitric acid test, magnet, spark, hardness, and muriatic acid tests, sulphur spot and nickel spot tests, and the stabilization test, and shows when and how to use each one. By closely following the instructions on the chart, it is possible to check the identity of Stainless Steels which may be in question.

This chart can be used in your laboratory, to help your stockroom, warehouse or production department check on mixed stocks. Its convenient size makes it easy to use right on the testing table. To obtain a copy, simply send us a note on your company letterhead, indicating your title. Your request will receive prompt attention.

The Carpenter Steel Company, 121 W. Bern Street • Reading, Pa.

Carpenter **STAINLESS STEELS**

...for
Strength
Rigidity
Heat Resistance
Corrosion Resistance
Longer Product Life
Sales Appeal

BRANCHES AT
Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

Washington . . .

L. W. MOFFETT

• General problem of surplus property disposal appears to be no nearer solution... Clayton bill objected to on ground that it places too much power in one man's hands . . .

WASHINGTON — The general problems of surplus disposal are no nearer being solved at present than they were several months ago when this column predicted a rocky future for Will Clayton's Surplus War Property Administration.

The "goldfish bowl" requested in the Baruch-Hancock report has rapidly passed out of the translucent stage until it is now almost opaque. On policy levels no one seems to know whether the Army is in or out of surplus disposal. Much doubt is also being expressed over the issuance of the recent FEA advisory committee report on the disposal of foreign surpluses. It is believed that this report is only a feeler, with the real plan on foreign disposal yet to come. Undoubtedly the Army will play a large part in this problem.

On the operating level the Treasury Disposal Unit which has been disposing of consumer goods surpluses, including automotive supplies, has really fogged the goldfish bowl. It is just as difficult to get information on surpluses to be sold as it has been in the past.

On top of all this, it is reported that Mr. Clayton has offered to resign over the recent Texas political controversy. Although Mr. Clayton's integrity and ability are unquestioned there are many in this city who would not be sorry to see him go. Congressional leaders are beginning to feel that it was an executive mistake to create a super policy agency such as SWPA. They claim that policy and administration should be merged to achieve effective coordination.

On the legislative side Congress has been lax, for although approximately 50 bills relating to surplus disposal have been introduced during the past 18 months none has yet reached the President's desk. These bills range from one paragraph nonentities granting preference to special classes to overall demobilization including surplus property disposal as one factor.

One of these bills, S 1156, relating to the disposal of land and improvements thereon, passed the Senate on July 3, 1943, but no action has been taken in the House. HR 2795, giving the director of Bureau of the Budget authority to dispose of surpluses passed the House on June 9, 1943, but now lies dormant in the Senate. Hearings have been held on some of the other legislative proposals but there has not been much action.

If Congress does not soon rise to the occasion, the country will be in the identical situation which arose after the last war, that is, much planning, but no action.

AFTER the first World War it took four months and almost a division of men to complete the first inventory of surplus property and by the time the job was completed the listing was out of date. With surpluses at least 10 times as great as in 1918 it would be extremely serious to allow this situation to arise again. However, no adequate means of inventory control has yet been established.

Since Mr. Clayton appeared on the scene in February under presidential directive the need for legislation has become acute. However, Mr. Clayton with the cooperation of John Hancock, co-author of the Baruch-Hancock report, succeeded in forestalling any legislation until Mr. Clayton had an opportunity to prepare his own legislative suggestions.

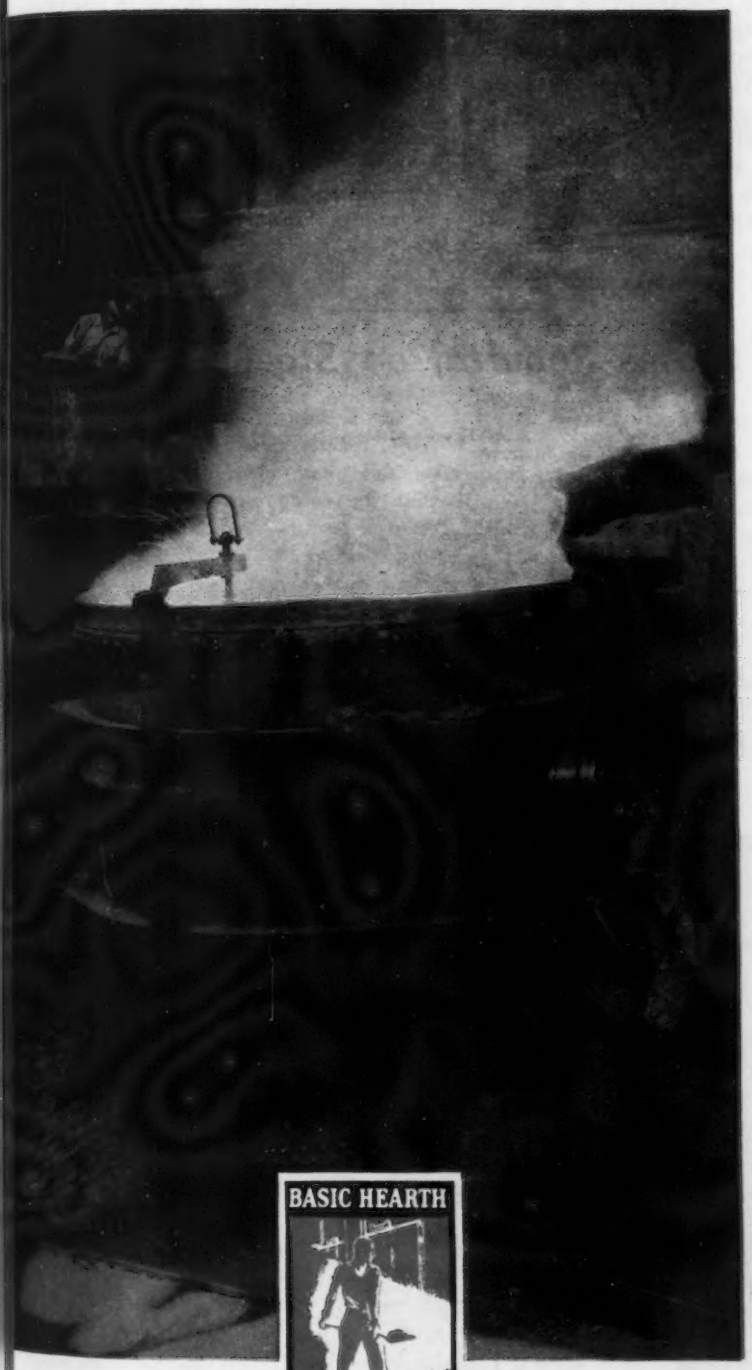
In early June Mr. Clayton had a bill ready but it was buried in a Senate report. Up until this time the bill has not received all the publicity it merits. While a first reading will make any industrialist smile with satisfaction, a little thought will reveal that the bill does practically nothing. An important Senate official told THE IRON AGE that "as we see this bill it merely gives Mr. Clayton a 'carte blanche' ticket to have supreme say in the disposal of surpluses and to continue operating as he is at present."

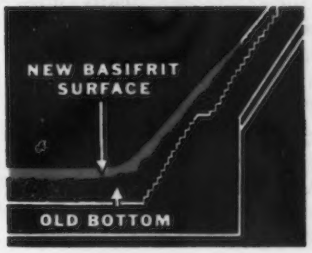
The nation will be greatly relieved to get away from centralized control when the war is over, but this bill

MASS PRODUCTION: *In France, Yanks operate a conveyor belt to facilitate the handling of huge quantities of ammunition of all sorts. American mass production methods are carried right on up into the front lines of the invasion area.*

To Keep Them Pouring

Resurface Open Hearth Bottoms with BASIFRIT





HERE'S a suggestion to add hundreds of heats to the life of that open hearth furnace whose bottom is old and unreliable: Resurface it with Basifrit.

Briefly, here's how: Before the furnace goes down for repairs, wash it down, using coke breeze on the banks and blowing them down with air about every hour. Run slag out every two hours. Continue until the hearth is washed down about 6 inches. Then start resurfacing. Throw in Basifrit with shovels, *without any admixture of slag* The quick-setting Basifrit burns in almost as fast as it can be shoveled. Apply additional layers, one after another, and finish with a light slag wash. Cool until cracks show, then heat up, coat with raw dolomite, and charge. Take off two or three heats before shutting down the furnace for the repairs. The whole job takes 52 to 54 hours.

Resurfacing is just that simple—with minimum lost production. In fact, resurfacing time is not lost time, because it is soon more than made up by reductions in delay time between heats. And you have a sound bottom to protect the quality of your steel.

Basic Refractories Engineers are always at your service on any problem of hearth construction, repair or maintenance.

BASIC HEARTH
REFRACTORIES

BASIC REFRACTORIES, INCORPORATED
CLEVELAND 15, OHIO

gives all of the power in surplus disposal to one man. Although Mr. Clayton's bill calls for an advisory board several measures which give such a board more than advisory authority have been approved by business men appearing before Congress.

The bill does not specifically provide for business advisory committees for each class of property. Committees of this nature have proved valuable to WPB and would undoubtedly aid in carrying out disposal policies.

NORMAL commercial channels of trade are not sufficiently protected by the bill, which leaves the door open for speculators. The provision in the bill which touches on regular trade channels leaves too much to the discretion of the administrator.

Another troublesome question is the operation of the Army and Navy in sales of scrap, salvage and surplus material. On the same day that Army officers were protesting that they had nothing further to do with surplus disposal other than to declare their own material as such, a high surplus property official told THE IRON AGE that he hoped "Congress would take the Army out of the picture completely." Mr. Clayton's bill gives no assurance on this point. If the Army is allowed to retain goods that are obviously surplus as was done after World War I, then surplus property disposal might as well be written off as another government failure at trying to do a businesslike job.

There is also no guarantee that surpluses will be sold in reasonable lots, instead of combining ships, cotter pins, and shoe polish, as was done after the last war. It is clear that only speculators can afford to buy materials offered for sale in this manner.

In general, the chief objection to this bill is that it places too much power in the hands of one man without giving any guarantees to American business that it will be protected from such abuses as indiscriminate dumping.

What has happened to this bill is an interesting story. The Senate Postwar Committee, with reported administration backing, held hurried executive sessions before the recent adjournment. The heads of the various government departments were requested to appear, and with few exceptions expressed their approval of this further continuation of one-man government. No doubt an attempt to rush this legislation through both houses will be made when Congress returns to Washington. The bill has been introduced in the Senate by Senator Johnson, democrat of Colo., and in the House by Representative Colmer, democrat of Miss.

Union Closes Rebuttal on Steel Case

Washington

• • • **CIO President Philip Murray** closed the union's rebuttal of the steel and iron ore industries' case before WLB panels on July 12 with an impassioned plea to the steel industry to abandon what he called its "dull, thick, corroded system of thinking" and adopt a less "stupid" attitude on labor relations.

Mr. Murray said that the industry's rebuttal to the labor brief was founded upon figures of the Bureau of Labor Statistics and therefore "predicated upon a false premise," and that the companies have made substantial profits enabling them to afford to meet the union's demands. He charged the companies with concealing huge profits "particularly in the nature of extortionate reserves for depreciation."

Criticizing the industry for what he termed its failure to offer constructive postwar planning, Mr. Murray urged constructive thinking in the industry, particularly toward labor relations.

He cautioned industry not to link itself to another apple selling era. Prosperity, he said, is only possible when the consumer has money and that the wage earners represent the consumer.

Earlier, CIO General Counsel Lee Pressman completed the reading of the union's rebuttal brief, highlighting the major points set forth in the original brief filed with the panel.

The steel and ore producers were given until July 25 to file statements in answer to the union's rebuttal. Originally the panel had planned for a question period to interrogate producers and union representatives regarding points raised at the hearings but subsequently this plan was abandoned.

Meanwhile arrangements were made to begin hearings before the Miscellaneous panel early in August. Foundry interests will present their case before this panel, whose job has been tremendously bulged by the ambitious USWA.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

'I'D LOVE TO DO SOMETHING TO HELP WITH THE WAR... LIKE RUNNING A LATHE OR SOMETHING IN WAR PRODUCTION!
I KNOW WHUT TH' BULL O' TH' WOODS IS THINKIN'--HE'S TRYIN' TO FIGURE WHERE HE COULD PUT HER TO KEEP HER OUT OF SIGHT FER TH' DURATION!
WELL, FIGURE IT YOURSELF--SHE'S BEEN IN HERE ONE MINUTE--EIGHT MEN, EIGHT MINUTES LOST... A THOUSAND MEN--YOU'RE A MATHEMATICIAN!
J.R.WILLIAMS
T. M. REG. U. S. PAT. OFF.
WORSE THAN A STRIKE
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The SHEFFIELD MICRO-FORM GRINDER

PRODUCES PRECISION PROFILES *Faster* AND AT *Lower Cost*

1. No templates required
2. Produces profiles with time saving up to 75%
3. Work is checked without removing from machine
4. Uses standard inexpensive wheels
5. Wheels require no special dressing

Grinds materials of any hardness including tungsten carbide.
Produces forms to an accuracy of .0003".

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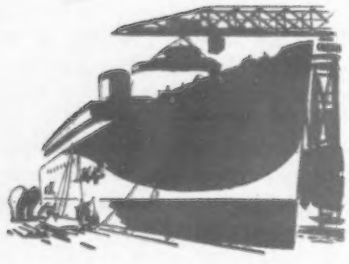
MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICES

WEST COAST . . . OSGOOD MURDOCK

• Chairman Maury Maverick of SWPC suggests subsidies for small business in postwar conversion and decentralization . . . Practically new war agency team takes Pacific regional field for second half.



SAN FRANCISCO — That picturesque, forthright, outspoken Texan and self-styled champion of little business, Maury Maverick, vice-chairman of WPB and chairman of Smaller War Plants, spent last week on the Pacific Coast making speeches, holding press conferences and lunching, dining and meeting with bankers, industrialists, Chamber of Commerce executives, public officials and almost everyone but the "monsters, the giants of production, the gargantuan war babies whom the war has created on the Coast."

Before the sober and sedate Commonwealth Club, Maury Maverick suggested that a "pioneer is nothing in God's world except a person who gets off his haunches and moves around and fights for what is right." He expressed his affection for Californians because "they are cheerful and appreciative and raise hell when they ought to." He suggested that the West became great because the people were willing to take risks; they were gamblers. "Keep fighting!" he challenged. "Don't take 'no' for an answer. Don't ever give up demanding attention. Make everybody know that you are as close to Washington as Maryland and Virginia."

These were welcome words all along the West Coast to those who have felt the handicap of distance, misunderstanding and now the new situation of a prolonged Pacific war and consequent concentrated war production and shipping effort way past the time when the rest of the industrial nation and most of the workers are turning their attention to reconversion, rehabilitation and relocation.

Maury Maverick joins the company of those who fan the flames of sectionalism. He was a member of the East-versus-West gang on his recent trip but at home in Texas it may be South-versus-North. In his official capacity he wages the war of Big versus Little. It was his proposal last week that there must be a great West Coast plan, including British Columbia, Alaska and the West Coast of Mexico as well. Discriminatory freight rates must be abolished, he declares, and big war born industry should be broken up into smaller cells. Small business and smaller plants should be encouraged by having first chance to convert and return to civilian production, by getting the first crack at surplus properties, by credit insurance on production and reconversion loans, by technical assistance from SWPC and by an incentive taxation plan. A study is being made, he says, jointly by RFC, DPC and SWPC of industrial plants built during the war for war as to what must be done to justify the plant in the postwar market and how it can be improved. "In regard to plants in the Western area we are studying prewar, current and prospective demand for the products, and working on the lowering of transportation costs."

In rapid passing, Chairman Maverick declared that "the West Coast will probably spend over a billion dollars on public improvements within five years after the war. . . . The whole wide world can be seen just outside your window. . . . Eventual shipping out of the Pacific Coast ought to increase two, three and more times. . . . Giant cargo planes will bring the West closer to the hungry markets of the East. Too much big business or little business without any big business (or too little little business) will make everybody broke."

It is his thought that the life of SWPC should be extended "for a couple of years" since there are probably two million contracts and subcontracts to be cleaned up and bankruptcy will result if settlement is not prompt.

AS he proceeded to encourage sectionalism, proclaim that there is discrimination in transportation, rates by "the East," suspect big business, champion little business, and suggest the solution through combination of a rampant and industrially self-conscious West in partnership with such benevolent government agencies as SWPC, RFC, DPC, WPB and the Power Administrations of the Department of the Interior, certain wise and level-headed counsellors wondered whether the suggested cure might not bring new complications at least as painful as present difficulties. A "smaller war plant" is assumed to employ 500 or less "during normal operations" but over a million little businesses have less than 100, and probably less than 25 or 50 employees, according to Chairman Maverick. He thinks that the definition should specify "any business not too large which is locally owned and locally operated."

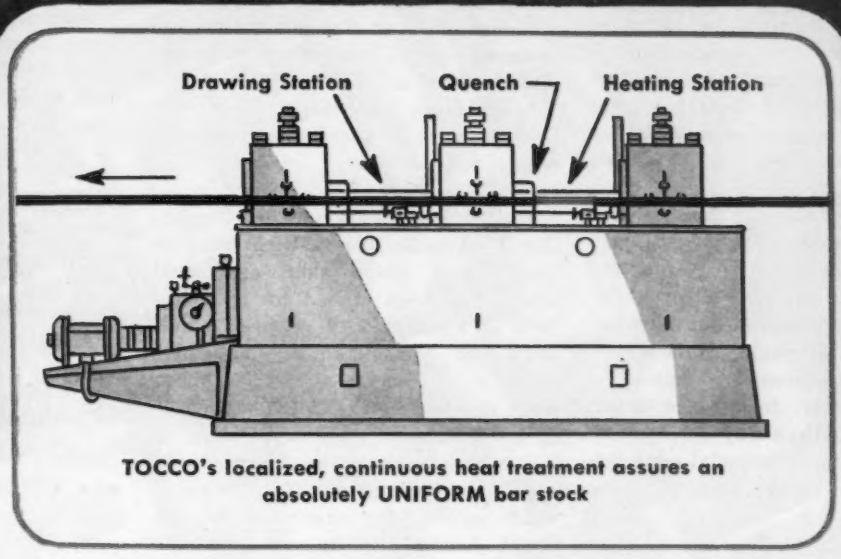
In Region 10, including the Central Pacific area, during the year just closed a total of 14,280 prime contracts, sub-contracts and purchase orders for a value of $80,678,421 was distributed to smaller plants. War materials to the value of $77,654,788 were included in 7040 contracts from 29 government procurement agencies. Non-government jobs and orders placed by non-federal agencies, municipalities and large corporations were included in 7240 contracts for a value of $3,023,633. Of the year's contracts it is stated that 94 per cent for 80 per cent of the dollar value went into plants having less than 250 workers, and 60 per cent of the contracts for 41 per cent of the dollars were placed in plants having less than 50 wage earners each.

Yet, if it had not been for Permanente Metals Corp. (Kaiser), Marin and California Shipbuilding Corps. (Bechtel) and Douglas, Boeing, Consolidated, North American Lockheed, Alcoa and Columbia, Bethlehem and Geneva Steel where would the thousands of sub-contractors and sub-subcontractors have found their war work? At Richmond a most interest-

CUT COSTS 50%

IN HEAT-TREATMENT OF BAR STOCK

Conventional—$30 per ton **Tocco Process—$15 per ton**



TOCCO's localized, continuous heat treatment assures an absolutely UNIFORM bar stock

STANDARD steel bar stock enters the TOCCO machine shown above, is heated, quenched and drawn continuously as it passes through. It emerges as a *straight, scale-free* heat-treated bar with an absolutely *uniform* metallurgical structure throughout its entire length and cross-section (for maximum machining speed). All this at half the cost of the conventional method.

As many as eight TOCCO Bar Stock Units can be operated by one man, producing any desired tonnage of heat-treated stock in sizes of 3/8" to 3" diameter—any length.

Typical performance is for one man to treat 1 ton of 1-inch, S.A.E. 1045 stock per hour—hardened to 63-64 R.C. and drawn to 30-31 R.C. as shown above. Comparison of results:

CONVENTIONAL METHOD	TOCCO PROCESS
Costs $30 per ton	Costs $15 per ton, total
Heavy scale	Scale-free
Bar is distorted	Bar is straight
Hot, dirty conditions	Cool, clean
Non-uniform structure	Uniform throughout

TOCCO Engineers will gladly explain this machine further and study its application to your particular problems. Bulletin No. 14 free on request.

THE OHIO CRANKSHAFT COMPANY • CLEVELAND 1, OHIO

TOCCO

HARDENING..BRAZING
ANNEALING..HEATING

★

ing development is Permanente's yard 4 operation. This is probably the zenith of decentralized prefabrication where 25 upstate California contractors located from Sacamento to Gilroy provide the Kaiser management with sections of ships which are zipped together and outfitted and delivered from Richmond. This type of operation makes use of big business contracts, purchase and assembly facilities, yet permits dozens of subcontractors to continue a lucrative business and maintain steady employment. By this process and from this yard, 15 LST's, 12 S2-s2-AQ1 frigate escort vessels and now a flock of C1-M-AV1 pint sized Liberty ships are being delivered.

Many level-headed, far-sighted, open-minded leaders on the West Coast believe that without the giants the pygmies would have starved or never would have been born, but without the East the West would still be waste and that in postwar planning a declaration of inter-dependence is far more promising than any declaration of independence or provincial urge for decentralization and Federal subsidies.

* * *

As the second half opens, practically an entire new team is taking the field among chief War Agency executives for the Federal government on the West Coast. Leo F. Gentner, regional director for OPA, has resigned to enter the candy business. His former assistant succeeds him. W. K. Hopkins, regional director for War Manpower Commission resigned to return to private industry in southern California. Eugene Weston, Jr. who has been on a very hot spot as chief regional representative for the National Housing Agency in charge of all war housing, has returned to private practice of architecture in Los Angeles. Lloyd Fisher, director of Wage Stabilization for the 10th Regional War Labor Board and a government economist for ten years, has resigned to become research chief for the International Longshoremen's and Warehousemen's Union, CIO. He is a graduate of the University of Pennsylvania, 1931, and studied economics at the University of Paris thereafter.

R. L. Lanborn who has been on leave of absence as assistant purchasing agent for Columbia Steel Co. while for the past two years he was in charge of the OPA price division on scrap metals and machinery in the regional office at San Francisco, has resigned both connections to join Kaiser Steel as chief scrap and mill raw materials purchasing agent with headquarters at the Oakland general office.

* * *

United Steel Workers, CIO, through the labor press points with headline pride to a union shop agreement which has been signed by its Local 2869 at Fontana with representatives of Kaiser Steel management which accedes in advance a 17c. per hour wage demand before WLB. It seems to be stipulated in a supplement to the contract that the management agrees to include the 17c. raise if WLB grants the steelworkers' national demand, to be retroactive to date of the USWA certification at Fontana regardless of retroactive date in the WLB order. The Fontana agreement is effective as of June 3. In dealing with West Coast labor the disposition of the Kaiser management has been conciliatory and is unequivocal.

* * *

Mill reports from Fontana indicate that several thousand tons of shell steel have been rolled on the new blooming mill, that the foundry poured a record of 741 tons of good casting in a six-day week ending July 1, and that the Vulcan mine broke previous ore production records last month with a total tonnage of 77,114.

* * *

Five San Francisco smaller plants have had disallowances for a total of $37,495 assessed against them by the regional War Labor Board enforcement division for violation of the Wage Stabilization program in their tool and die department. Investigations established that wages were being paid employees and new employees were being hired at rates above ceilings of $1.35 for tool and die workers. The companies admitted wages at rates in excess of $1.53 paid without Board approval. In imposing the sanctions against the companies, the enforcement panel stipulated that a percentage of the total of illegally paid wages must be disallowed for income tax purposes as follows:

	Amount of Payroll	Amount Disallowed
Enterprise Engine & Foundry Co.	$3,630.41	$3,000.00
General Tool, Die & Stamping Works	18,327.71	10,000.00
Holt Tool & Die Co.	7,844.40	5,333.30
Stanger Manufacturing Co.	13,222.45	13,222.45
Victor Equipment Co.	16,169.82	5,389.94

WPB Lifts Restrictions on Use Of Aluminum and Magnesium

Washington

• • • **Pointing out that** it was conforming to recent decisions to lay the groundwork for eventual conversion to peacetime output, WPB has announced rules permitting wide new uses of aluminum for essential products, and at the same time lifted restrictions on the use of magnesium.

The new rules relating to the use of aluminum, contained in Supplementary Order M-1-i, provide that the metal may be used in the manufacture of cans, subject to packing quotas applicable to all cans under Order M-81 and for making pots and pans to the extent allowed by the L-30 series of WPB orders. In addition, rules relating to the use of aluminum in the manufacture of closures were liberalized. Furthermore, aluminum may be substituted for any other metal in the manufacture of any item. The order prevents this substitution from creating an increase in total production because to do so might divert manpower from essential operations.

Modifications of the magnesium order, M-2-b, lift restrictions on use of the metal in other than ingot or raw form and provide means for its distribution to civilan uses. It may be used as a substitute for other metals in the same way as aluminum. Since there are no large uses for magnesium at present, it is expected that its civilian uses will be largely for experimental purposes.

. . . Cited for Awards . . .

• • • **The following companies** have been awarded the Army-Navy E for excellence in war production:

De Laval Steam Turbine Co., Trenton, N. J. (fourth star)
Eastern Heat Treating & Brazing Corp., New York.
Simons Machine Tool Corp., Albany, N. Y. (third star)
Atlas Metal Stamping Co. and **Atlas Tool & Designing Co.**, Philadelphia.
Jessop Steel Co., Washington, Pa. (second star)
Lea Mfg. Co., Waterbury, Conn.
Hillerich & Bradsby Co., Louisville, Ky.
P. R. Hoffman Co., Carlisle, Pa.
Litton Engineering Laboratories, Redwood City, Cal.
Motiograph, Chicago.
Perfect Circle Co., Hagerstown, New Castle, Richmond and Tipton, Ind.
Wehr Steel Co., Milwaukee.
Worcester Stamped Metal Co., Worcester, Mass.

IF YOU WANT TO WORK MAGNESIUM ASK US

WE ARE EXPERTS IN EVERY FIELD OF HYDRAULIC MACHINERY FOR WORKING MAGNESIUM AND OTHER LIGHT METALS AND ALLOYS.

ANY IMAGINABLE SHAPE CAN BE EXTRUDED ON OUR HYDRAULIC PRESSES. QUICK CHANGE OF DIES GIVES WIDEST RANGE OF VARIATION.

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ENGINEERS CONTRACTORS

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STRETCHERS · PUMPS · ACCUMULATORS

570 LEXINGTON AVENUE · NEW YORK · N. Y.

PERSONALS

A. WINKLER PRINS, New York district sales manager, American Machine & Metals, Inc.

• **A. Winkler Prins** has been appointed manager of the New York district sales territory of American Machine & Metals, Inc., East Moline, Ill. Mr. Prins has been associated with the Worthington Pump & Machinery Corp., the Novo Engine Co., and Hubbard & Floyd, Inc. Prior to his present association, Mr. Prins was eastern sales manager for the Wellman Engineering Co. He will supervise the sales and service activities of American Machine & Metals, Inc., for their Troy Laundry Machinery, DeBothezat Fan, Riehle Testing Machine and Tolhurst Centrifugal Divisions.

• **Charles F. Sargent** has been elected president of Sargent & Co., New Haven, Conn. He succeeds **Murray Sargent**, who has resigned as president of the company but who will continue as chairman of the board.

• **W. G. Lewellen** has been appointed assistant to E. F. Johnson, vice-president of General Motors in charge of the Eastern Aircraft Division and of the Dayton Divisions. Recently he has been associated with the General Motors central office war staff.

• **D. E. Batesole** has been elected vice-president and chief engineer, Norma-Hoffmann Bearings Corp., Stamford, Conn. Mr. Batesole has been a member of the firm's Engineering Department for over 25 years, and has been chief engineer since 1937.

• **George W. Gilliland** has been made manager of the Los Angeles district sales office, Joseph T. Ryerson & Son, Inc.

• **Charles H. Granger**, retired president of the old Waterbury Clock Co., has been made general manager of the Waterbury, Conn., Tool Division of Vickers, Inc., to succeed **Walter M. Pohl** who goes to Vickers Detroit plant. Mr. Granger has been associated with the brass industry 40 years.

• **Joseph H. Hart** has been appointed laboratory director of Kelite Products, Inc., Los Angeles. **Meredith H. Fairchild** succeeds Mr. Hart as chief chemist and **Donald W. Vance** has been made analytical chemist.

• **Gordon S. McKenty** has been named general sales manager for R. G. LeTourneau, Inc., Peoria, Ill., to succeed E. R. Galvin, resigned.

• **Victor J. Hanson** has been appointed director of training schools and safety engineer for the Stamford Division of the Yale & Towne Mfg. Co., succeeding the late John B. Chalmers. Mr. Hanson's production experience with Yale & Towne extends over 25 years.

• **Dr. I. A. Oehler** has been appointed chief process engineer of the American Welding & Mfg. Co., Warren, Ohio. Prior to joining the American Welding staff more than a year ago, Dr. Oehler was open hearth metallurgist of the Buffalo district of Republic Steel Corp. **Thomas J. Wood** has been made supervisor of arc welding.

DR. I. A. OEHLER, chief process engineer, American Welding & Mfg. Co.

BARTLEY WHITESIDE, vice-president in charge of sales, Herbert Hall Co.

• **Bartley Whiteside,** for the past year superintendent of production at Plant No. 7 of Wright Aeronautical Corp. at Woodbridge, N. J., has been made vice-president in charge of sales of the Herbert Hall Co., machine tool dealers, Newark, N. J. Mr. Whiteside had been connected with Wright for 19 years. He organized the intensive learner training program at Wright a year before the war and it became the model for many other war plants throughout the country.

• **Howard R. Murphy** has resigned as manager of the Merchandise Department, Caterpillar Tractor Co., Peoria, Ill., to become distributor for Caterpillar in San Antonio and Corpus Christi, Tex.

• **S. E. Hackett** has joined Porter-Blairsville Co., Blairsville, Pa., a division of H. K. Porter Co., Inc., of Pittsburgh, as vice-president in charge of production. Mr. Hackett was formerly president of the Jones & Laughlin Steel Corp., having been associated with the corporation for 20 years until he retired in 1938.

• **Frank R. Pierce,** who has been manager of the General Motors Public Relations Department, Detroit, has joined the personnel staff of the corporation. **John E. Johnson** will succeed Mr. Pierce as head of the Detroit office.

• **F. S. Wynans,** formerly of the planning staff of Carnegie-Illinois Steel Corp., has been appointed secretary-treasurer of the Duraloy Co., Scottdale, Pa.

JAY W. OWINGS, assistant manager of tubular sales, Youngstown Sheet & Tube Co.

• **Jay W. Owings** has rejoined the Youngstown Sheet & Tube Co. as assistant manager of tubular sales, after two years' service with the WPB Steel Division. Mr. Owings was with the Youngstown Sheet & Tube Co. for 14 years before joining WPB, spending eight years in the Metallurgical Department and six years in field service.

• **Ralph O. Anderson** has been made district manager of the new West Central, Rocky Mountain district of the Norton Co., Worcester. He will make his headquarters in Denver.

• **Roland J. Schmitt** has been appointed manager of the Pacific Northwest Division, E. C. Atkins & Co., Indianapolis, succeeding **H. G. Mackenzie**, who has resigned. **A. Stanley Caster** has been made office manager of the company's Portland, Ore., office.

• **Harold C. Osman** has been appointed sales manager of Crucible Steel Casting Co., Lansdowne, Pa. He was formerly with the Reading Steel Casting Division, American Chain & Cable Co., Inc.

• **Wlliam H. Seaman**, president and general manager, has been made chairman of the board, National Roll & Foundry Co., Avonmore, Pa., succeeding **R. Howard Webster. Richard J. Buck** has resigned as vice-president but will remain as a director of the company; **C. N. Buchholz**, controller, and **E. R. Pierce**, general superintendent, have been made directors succeeding **Colin W. Webster** and **J. A. Weingart; Donald H. Baum** has been elected vice-president in charge of sales and a director of the company.

• **Charles A. Powel**, manager of headquarters engineering of the Westinghouse Electric & Mfg. Co., has been elected president of the American Institute of Electrical Engineers for the year beginning August, 1944.

• **David P. Graham**, for several years manager of the Gas Scrubber Division of Peabody Engineering Corp., New York, has been made assistant to the president. In addition to his new duties, Mr. Graham will continue to direct the Scrubber Division.

CHARLES E. SORENSEN, president, Willys-Overland Motors.

• **Primus C. Clark**, president and tive vice-president of the Ford Motor Co., has been elected president of Willys-Overland Motors. He will assume direction of the company's operations at once, supervising its war production program and its plans for the postwar manufacture of vehicles.

• **F. F. Sampson**, manager of the New York branch, Electric Storage Battery Co., Philadelphia, has retired after 30 years of service. **Daniel P. Orcutt**, who has been assistant manager since 1921, has succeeded Mr. Sampson as manager. Mr. Orcutt has been with the company since 1910.

OBITUARY...

• **Frank B. Thompson**, 78, former vice-president of the American Bridge Co., U. S. Steel subsidiary, who retired in 1936, died recently. Mr. Thompson began his career in the steel industry in 1886 with the Carnegie Steel Co. In 1905 he became auditor of the American Bridge Co., and was appointed vice-president in 1927. He was also auditor of the Canadian Bridge Co., a U. S. Steel subsidiary.

• **Henry W. Phelps**, former chairman of the board of the American Can Co., New York, and recognized as a pioneer and leader in the canning industry, died July 7. He was 80 years old.

• **Harry J. Deutsch**, 49, manager of the Fairfield-Bridgeport plant of Aluminum Co. of America, died July 5. He was formerly superintendent of the Detroit Alcoa plant and was active in affairs of the American Foundrymen's Assn.

• **George C. Purdy**, chairman of the board of Greenlee Brothers & Co., Rockford, Ill., died July 2, at the age of 73 years. In 1893 he became associated with Greenlee Brothers, beginning a period of service with that organization, which reached 50 years in 1943. Mr. Purdy was elected president in 1919 which position he held until he was made chairman of the board in 1943.

• **Francis P. Gormely**, president of the Electro Metallurgical Co. and other units of the Union Carbide & Carbon Corp., New York, died July 13. He was 56 years old. Mr. Gormely joined Union Carbide in 1909, advanced steadily in various positions, becoming vice-president and general manager of the metallurgical group in 1929, and president in May of this year.

• **Primus C. Clark**, president and founder of the Clark Controller Co., Cleveland, died July 8.

• **Fred L. Mills**, 49, president of Mills Industries, Inc., Chicago, died July 5.

• **Charles Radley**, 78, retired president of the Reliance Foundry Co., Cincinnati, died July 5.

• **Oscar W. Kirsten**, president of Doelger & Kirsten, Inc., Milwaukee, died June 30. He was 53 years old.

• **Martin V. Haskins**, vice-president and treasurer of the Haskins-Haire Wire Works, Worcester, Mass., died recently. Formerly he was associated with the Wright Wire Co. and Wickwire Spencer Steel Co., Springfield.

• **Arthur B. Smith**, an executive of Leavitt Machine Co., Orange, Mass., died July 3. He was 71 years old.

Fatigue Cracks . . . .

BY A. H. DIX

Lone Dissenter

• • • Even as late as the beginning of this month, winged bombs were being given an editorial once-over-lightly by the nation's press, frequently with slightly humorous trimmings. But not by your favorite family journal, which declared on page 31 of the pre-Churchill speech issue of June 29:

> Jet-propelled bombs have caused far more damage in Britain than has been admitted. This German innovation . . . has been pooh-poohed, but . . . is destined for far greater usage.
>
> . . . there is every reason to believe that jet bombs can develop into one of the most efficient methods of delivering high explosives within a range of several hundred miles, with reasonable accuracy.

If, among the country's 4,300 magazines and newspapers, ours was not the sole voice crying in the wilderness, please do not disabuse us, as we like to think that no other publication has a brains department as prescient as ours.

Old Stuff

• • • Which gives us an opportunity to take the lid off something that has been simmering on the slow burner of our cerebellum through most of this semester, and that is the tendency to cry down a new development because of previous ineffectual stabs at it.

For example, editorial commentators depreciated the flying bomb—before Churchill spoke—on the grounds that we and practicaly every other nation had some old models in arsenal attics. Old stuff, they called it. We suppose that when Savery, Newcomen and Watt were working on their various steam engines the cynics of the day constantly reminded them that Hero of Alexandria had made one seventeen centuries before, and what did it amount to? A toy for turning spits and making fountains squirt.

We do not contend that civilization has been advanced by the development of a successful flying bomb, but certainly world progress has been retarded at least three centuries by those who croak "We tried it twenty years ago and it flopped."

Sir Henry to the Stand

• • • For supporting evidence we are indebted to George (Jones & Laughlin) Bond, who informs us, via Ketchum, MacLeod & Grove's house magazine, "Dividends," that Sir Henry Bessemer said in his autobiography:

> I had an immense advantage over many others, inasmuch as I had no fixed idea derived from long-established practice to control and bias my mind. Hence I could, without check or restraint . . . strike out fearlessly in an absolutely new direction, if thought desirable.

Winged Rebel

• • • The companion piece is the fable of the bumble bee whose body weight is so great in relation to his wing area that flight is aerodynamically impossible. But the bumble bee does not know this so he flies anyway.

He Didn't Know It Couldn't Be Done

• • • We would like to back up Sir Henry and the bumble bee with something that happened recently in our segment of industry—the graphic arts. The superintendent of a small, isolated plant received orders from his boss to correct a situation that, unknown to the superintendent, had been receiving the attention of the industry's best minds for a quarter century.

Blissfully unaware of the fact that the best minds had nothing but stubbed toes to show for their labors, the superintendent hit upon a beautifully simple solution, proving that there are times when it pays to be ignorant.

Backpat Returned

• • • Undoubtedly you receive the English aviation journal, "Flight." It would be too bad, however, if the enclosed ad from a recent issue did not come to your attention.

I am sure you will get a kick out of this reference to something in The Iron Age and this exhibition of camaraderie which undoubtedly exists between Americans and Britons.

—*Carleton Beckwith, Advertising Manager, New Departure, Div. General Motors*

The advertisement Mr. Beckwith clipped from "Flight" is one of Desoutter's, the English maker of portable tools, at which we tossed this bouquet:

> Our kinship with the English is further enhanced by observing that Desoutter, the English manufacturer of portable tools, makes proper use, in his advertising, of such Americanisms as "Pass the buck" and "Give us a big hand." Nothing contributes so much to harmony between nations as a common language.

Out of gratitude, Desoutter refers to us as "that fine American journal." In decency it could do no less, and we are only moderately thankful, as "fine" has too many meanings to suit us—*slender, thin, keen, pure, refined, subtle, delicate, elegant, showy, artful.* We don't care for any of them, and have to go clear to the end of the list of synonyms for "fine" in our drug store dictionary to find some that will do. The list ends with "admirable, splendid," which are acceptable. But the reader might not get that far.

Assez bon—no bon! Nothing but the best is good enough.

So next time, Desoutter, please play safe and call us illustrious.

Gift Horse's Teeth Examined

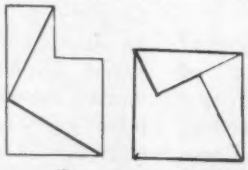
• • • We would also like to complain about the position of the magazine held by Uncle Sam. If you had a microscope you would see that it is your favorite family journal, but it is held rear end foremost, and even in the original the title is sketched in so lightly that we missed it until Technical Editor Frank Joseph Oliver's 20-20 orbs spotted it. Next time, Desoutter, right end up—and bolder.

Stopper

• • • The boss was a troublemaker, until. . . . —*Aluminum Company of America*

Puzzles

The diagram to the left shows how last week's piece of scrap plate was cut in two straight cuts. The diagram to the right shows how the pieces were put together to form a square.



As it is hot, we will give you an easy one, but it must be solved within 90 seconds if you are to get a silver star, and within 60 seconds for a gold star:

How many pieces of type does a printer need in order to set up the page numbers of a 288-page book if he does not use any piece twice?

Have You Seen It?

THIS new postwar, general purpose Fairbanks-Morse Motor is available to industry now.

Never before have there been more stamina—more protection—more versatility—built into a motor housing.

You'll have to see it demonstrated to appreciate fully how much this motor can really offer you.

BUY WAR BONDS

Look at These Features!

- ★ It is a 40°C. motor.
- ★ It is a protected motor.
- ★ It has an optional conduit box assembly.
- ★ It has cross-flow ventilation.
- ★ It has ball bearings—sealed-in and protected.
- ★ It has the exclusive Fairbanks-Morse COPPERSPUN ROTOR.

Write for detailed information. Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
MOTORS
GENERATORS
WATER SYSTEMS
SCALES
STOKERS
FARM EQUIPMENT
RAILROAD EQUIPMENT

Motors

Dear Editor:

JAP MAP

Sir:

Recently I saw a map published by you several years ago of Japan, on which were indicated the principal industrial cities and the large industrial plants located in them. If these are still available, I should like to purchase four or five copies as they will be of especial interest with the probable extensive bombing of that country.

G. R. BENNETT, Vice President
Toledo Scale Co., Toledo, Ohio

● The map appeared in our Apr. 30, 1942, issue. Demand has exhausted our supply.—Ed.

LOST WAX CASTINGS

Sir:

We are intensely interested in your Feb. 10 issue because it has an article on a method of casting ferrous and non-ferrous metals using the lost wax technique. Can we get a copy?

A. FELDMAN
J. Yates Dental Mfg. Co., 340 W. Huron Street, Chicago 10

● We have no more copies of the issue, but are sending you a clipping of the article, "Precision Casting of Turbosupercharger Buckets." See also "Precision Castings," page 39 of our July 9, 1942, issue.—Ed.

CARBIDE MILLING

Sir:

Please quote us price of 25 reprints of the article, "Carbide Milling of Steel," in your June 22 issue.

J. E. CARLSON, Buyer
Wright Aeronautical Corp., Paterson 3, N. J.

● No reprints were made, but you have our permission to make copies.—Ed.

EDITORIAL INDEX

Sir:

Do you have an index of your articles? Would this be covered by your editorial index?

JACK L. DANE
Ingersoll Steel & Disc Division, Borg-Warner Corp., 478 W. Michigan Ave., Kalamazoo 10, Mich.

● Every issue has an index of editorial articles. See page 47. At the end of each half year an editorial index of articles in the previous six months issues is published and supplied without charge to subscribers who ask for it.—Ed.

AIRCRAFT CORROSION

Sir:

Please send me a copy of your May 18 article on the prevention of corrosion in aircraft parts.

G. M. BELLANCA, Chairman
Bellanca Aircraft Corp., Bellanca Airport, New Castle, Del.

● See also the June 15 article, "Zinc Plating of Large Aircraft Structures."—Ed.

NBP LATHES

Sir:

Is anyone making the lathes formerly made by Niles-Bement-Pond?

FOSTER P. DOANE, JR., Plant Manager
Sandy Hill Iron & Brass Works, Hudson Falls, N. Y.

● Niles Tool Works Co., Hamilton, Ohio. —Ed.

NO FRIGIDAIRE SHIFT

Sir:

Sheffield appreciates the fine cooperation we receive from THE IRON AGE in publishing news about our company. However, we are embarrassed by the wording over a picture on page 155 of your July 6 issue, which reads, "E. R. Godfrey, general manager, Frigidaire Division, Sheffield Corp." The caption was rewritten in your office.

While Sheffield occupies an important position in the precision instrument field, we have no hope that we might acquire such a successful division of General Motors as Frigidaire, our huge neighbor and friend, whom we view with respect and admiration. . . .

Sometimes the exception only proves the rule and we frankly admit our confidence in the editorial material which appears in THE IRON AGE for we consider it one of the truly great trade papers of the nation.

C. W. HAMILTON, Public Relations Director
Sheffield Corp., Dayton 1, Ohio

● The caption writer who transferred Frigidaire from General Motors to Sheffield without stockholders' or SEC permission has been knouted.—Ed.

PILL MACHINE

Sir:

Where can I obtain specific information concerning the automatic pill machine pictured on page 87 of your June 15 issue?

F. E. WELDON, President
Chromium Mining and Smelting Corp., Ltd., 1010 Canada Cement Bldg., Montreal, Canada

● From F. J. Stokes Machine Co., 5930 Tabor Road, Philadelphia.—Ed.

METAL POWDER

Sir:

If there be reprints available of the two-part article in your issues of June 29 and July 6 by E. V. Crane and A. J. Bureau entitled, "Presses and Processes of Metal Powder Products," we will be grateful for two copies.

B. T. BONNOT, President
Bonnot Co., Mulberry Road, Canton, Ohio

● No reprints were made but we are sending you clippings.—Ed.

PENNY HATERS

Sir:

Harking back to your May 4 editorial, which called the zinc-coated penny an "amateurish and confusing product of thoughtlessness and inaptitude," a cycle would be completed if all pennies were abolished.

I can remember when I was a boy in Berkeley (across the bay from San Francisco), the introduction of pennies to Sunny Cal. where the dime had, not so long before, been the smallest coin. The stores put on $3.98 and $1.49 sales so that you would get pennies back and they would get into circulation. There were plenty of diehards at that. A streetcar conductor in San Francisco would accept the pennies because he had been ordered to, but he then threw them into the street to express his own opinion. It happens that this comes under the "mutilation of the currency" laws and the Secret Service threw him into the pokey where he faced a term in San Quentin.

I don't remember what happened but the streetcars found out that pennies are legal tender up to $1. The Southern Pacific had the extensive cross-bay network of trains and boats. The fare was 10c. from anywhere across the Bay to San Francisco. Their ticket sellers refused to take pennies so a genius took a notary with him and tendered 10 pennies 200 successive times and was refused 200 successive times. He then brought 200 suits. As I remember it he could sue for only $200 and costs on each or, at least, that is what he did sue for. The Court held for him at once on the first suit and threw out the rest on the ground that the right to use pennies was established on the first suit and the others, therefore, were persecution. So the penny rolled to the Pacific. I was in Alaska in 1918 when dimes and nickels began to get in there. Up to 1916 two-bits was the least coin and in 1918, you could hardly buy anything for less. Shine, paper and most nickel items were still 25c.

Your editorials are among the most valuable in any national publication.

C. C. FINN
106 W. McGraw St., John Finn Metal Works, Seattle 99, Wash.

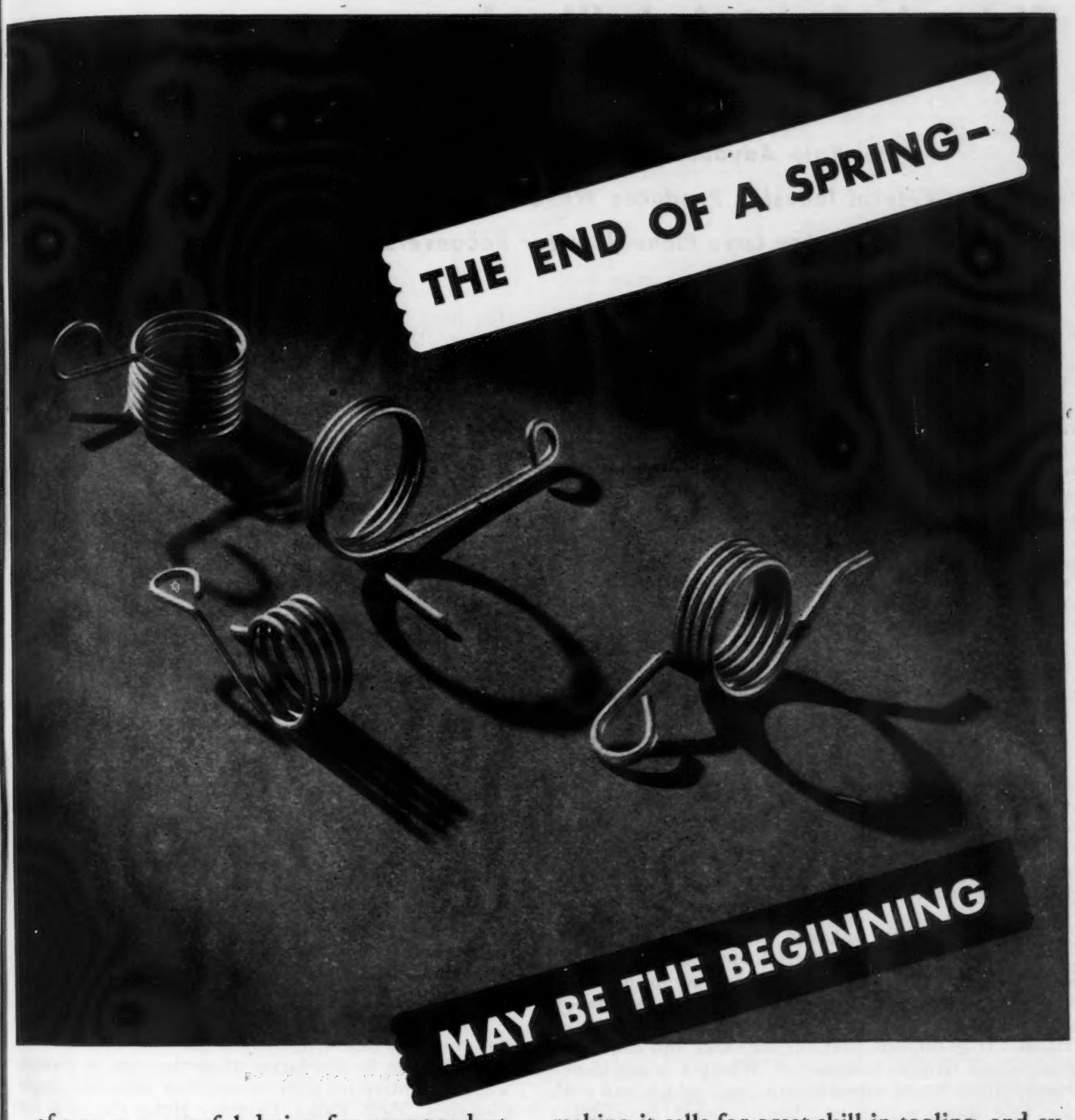
NOTCH EFFECT

Sir:

I am interested in obtaining an article by Professor George Sachs which appeared in a 1942 issue. I am not certain of the exact title but it deals with the notch effect and the multiaxial stress state that occurs at the root of the notch.

HERBERT DOBKIN, Engineering Department
Turbo Engineering Corp., Hancock & Lalor Sts., Trenton 7, N. J.

● The title was, "Notching Effects on Strained Metals." It appeared in the Oct. 8, 1942, issue, page 31, and the following issue, page 48.—Ed.



...of a more successful design for your product, with new adaptations, new uses, and new possibilities. For the types of ends possible on torsion springs are practically unlimited in size and shape. But engineering the best spring end for your application requires experience in design—making it calls for great skill in tooling, and extensive production machinery. That's exactly why you should turn to Muehlhausen engineers for solution to your difficult spring problems.

MUEHLHAUSEN SPRING CORPORATION
Division of Standard Steel Spring Company
817 Michigan Avenue, Logansport, Indiana

MUEHLHAUSEN
SPRINGS
EVERY TYPE AND SIZE

This Industrial Week . . .

- **Steel Rate Advances Slightly in Line with Effort to Boost Output**
- **Metal Industry Produces While Postwar Thoughts Bob Up**
- **Washington Lays Plans Now for Reconversion After German Defeat**

AT times resembling an orderly free-for-all with everyone well posted on his part, the steel and allied industries this week were (1) boosting output slightly to make up for recent losses, (2) rejuggling schedules so as to make the maximum number of items required by the armed forces, and (3) actively exploring, in thought at least, the problems and difficulties which are expected to follow the end of the European war.

After having been affected by heat, manpower shortages and holidays, the steel ingot rate this week gained some ground. Whether or not this gain can be retained or exceeded remains to be seen. If no improvement is noted in the near future, it will not be because the industry has failed to try every plan known to the "old heads" as well as the "new heads" to keep the rate up.

Steel scheduling experts this week were struggling with the vast problem of getting the first things done first in view of the stonewall attitude on the part of the military that the war isn't over yet. The struggling was occasioned not by the belief that steel people necessarily think the war will be over soon, but because of shut downs for repairs, maldistribution in product mix, green help, manpower shortages, and a myriad of other troubles considered by steel men to be too trivial for public mention.

WHILE actively engaged in fulfilling promptly all orders for war material, steel men and other industrialists cannot help but be occupied with thoughts of what will happen to production schedules if a sudden ending of the European war would materialize. It is obvious that the cutbacks and cancellations would be quite substantial. Whether or not these cancellations would affect mostly steel which had not yet been produced or whether it would completely stymie actual producion of steel in process cannot be told at this time. A recent consensus at various centers indicates that, at the end of the war in Europe, there will be a definite drop in actual output and a wholesale deflation of the present unwieldy backlogs. That such a condition would be temporary is obviously due to the pent up demand for civilian products. However, some observers believe that important reconversion to civilian production will be hindered by the lack of skilled workers as well as the absence of small, but nevertheless important, components going into the makeup of various civilian items.

From Washington comes the news that dramatic developments relating to reconversion occupied the forefront of industrial attention in the past week. Some of the more important actions included: The denial that contract cutbacks are being held up until after election day, a statement from Admiral Land that a new maritime program of 8,000,000 deadweight tons of shipping has been approved by the President and the joint chiefs of staff for construction in the first half of 1945, and the immediate preparation of preliminary plans by the War Department for cutting military programs as soon as Germany surrenders. The War Department on July 20 will present a definite plan for terminating war contracts to the Production Executive Committee. Recommendations will include how far programs should be cut and how cutbacks will effect important war production centers and cities.

On the steel market front this week order volume was up in some areas and down in others with the aggregate showing little change from a week ago.

CANCELLATIONS were coming through in the past week on sheet orders originally slated for the shell container program which was cut back recently by the War Department. This had little or no effect upon the general sheet market since the material cancelled in many cases represented unfilled tonnage. It was reported that some sheet users, desperate for deliveries, are drawing on warehouses for unusually large quantities. No immediate relief on extended sheet promises is in prospect for a variety of reasons.

One such reason is a reported NE increase in the landing craft program for 1944. Another is a Navy inquiry involving considerable tonnage of steel for portable warehouse units and still another accrues to the Navy which opened bids this week for its 1945 requirement on steel huts. Beyond that, Navy first quarter flat rolled needs involving considerable tonnages will be placed shortly.

Some centers believe that whether the war ends or not this year there is little chance for civilian steel allocations to be any larger than they are at present. The automotive industry is one that definitely shares this view. K. T. Keller, Chrysler Motor Co. head, has said that to resume production of automobiles, about 50 per cent of the war contracts would have to be removed from the Detroit area. He indicated that the Army recently placed many highly complicated production jobs in that area and with a shortage of engineers no production is feasible until Germany is defeated.

Steel ingot operations throughout the nation this week rose half a point to 96.5 per cent of rated capacity. Output in Chicago increased two points to 101 per cent while in Cleveland production climbed two and a half points to 96 per cent. In the Western District, operations increased one point to 95.5 and in the Eastern Area, the rate jumped 11 points to 94 per cent. District declines occurred in Pittsburgh, down one to 91 per cent; Wheeling, down two to 96, and Detroit, down three to 98. Youngstown at 95; Philadelphia at 98.5; Buffalo at 104.5; Birmingham at 97; Cincinnati at 98, and St. Louis at 99 remained unchanged.

• **COLD FINISHED BARS**—Cold finished bar makers are looking forward to a general easing up in requirements after the first of the year. Some are even entertaining thoughts that some postwar markets will come in for active exploitation early next year. At present the cold finished demand is pretty well formulated for the balance of this year. October seems to be the earliest deliveries are offered but large sizes which have been influenced by the shell program are more extended and in some cases reach to the end of the year.

• **NAILS**—The nail market is still tight as far as deliveries are concerned. Longest deliveries are being quoted on small sized nails which are used in boxing, crating, etc. Larger sizes are not as tight but nevertheless are more extended than was the case a month ago. Reason for this was heavy ordering recently by the War Department on medium and large sized nails.

• **TRANSFERS**—The WPB recently has done more transfering on orders and "shifting around" than has been the case for months. Some companies have been hit harder by strikes and manpower shortages than others. With urgent orders on books of these mills it became necessary to make the change. There have been little or no squawks from mills which have had to take the additional tonnage even though the product mix of those companies was further maladjusted to economical operation. The relationship between the WPW officials responsible for getting out the things the military want and the various steel companies is now probably at its highest point of cooperation. Mills insist that carry overs are heavy on some items and orders have had to be delayed because of last minute changes in programs and directives. WPB more than ever admits this but today also is more cognizant of the steel mill difficulties.

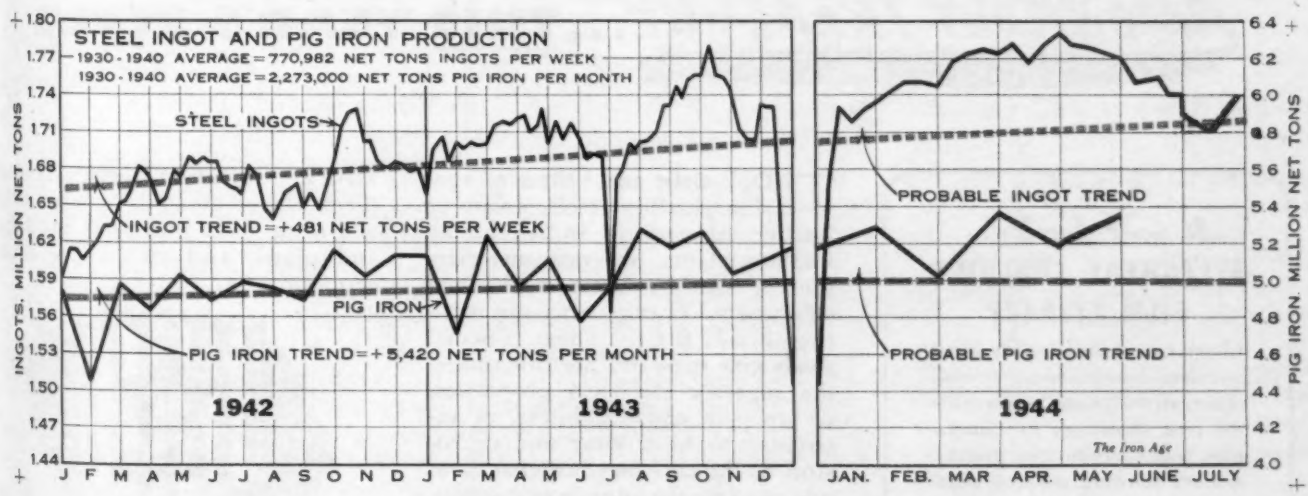
• **FARM MACHINERY**—Shipments to the farm implement makers this year will be somewhat ahead of last year. Rightly so the WPB has seen to it that 1944 would not be a year of shortages for farm machinery as was the case in 1943 when production of food was threatened. Nor is there to be any short changing on this field in 1945 according to reports. There is every indication that the farm implement makers will get as big a slice of the steel distribution in 1945 as was the case in 1944. If one phase of the war ends before the usual farm machine production period has ended even more steel will find its way to this important group.

• **STEEL SHORTAGE**—The old question of whether there is or whether there isn't a steel shortage has bobbed up again in some areas. Although the answer still seems the same, there are really two answers. It all depends on what group is giving the answer, one group saying there is no shortage and the other group saying there is a shortage. The real answer is that demand for some materials is so large that delivery would be impossible unless there is a cutdown in the demand for other materials somewhere along the line. A change in the events of war would cause this situation to melt away over night. Some observers say that there is too much steel already and that stocks are laying around the country in the form of unused inventories. Be that as it may, when the military wants its items it will get them and other less important requirements will have to step aside. Rather than a steel shortage there appears to be a selective use of existing capacity to fill rush jobs which will be just a memory in the future.

• **ALUMINUM HOPPER CARS**—What is said to be the first use of aluminum in hopper car construction other than on an experimental basis is seen in an order for 25 aluminum hopper cars, placed with American Car & Foundry Co. by the Missouri Pacific Railroad recently. Aluminum alloy will be used for the body in somewhat thicker gages than steel, giving comparable strength. The center sill and bolster of the cars will be of steel.

• **STEEL PRICES**—No action on the steel industry's price argument will be taken until the wage controversy has been settled. Nonetheless the bad product mix and the increase in the sale of items which bring small overall return is causing some steel company officials to grimace as they look at their monthly cost averages. This is bound to be the case as long as semifinished steel, shell steel, plates, ingots and other relatively low cost items are on the ascendency.

• **BESSEMER PATENT GIFT**—Sir Henry Bessemer's complete set of patent specifications for his iron and steel inventions and the only complete set of photostats of plans and scaled diagrams relating to Bessemer's patents have been given to Yale University by an anonymous donor. This action takes on added interest because of the reawakening interest in Bessemer steels in recent years. Many companies are carrying on continuous experiments for new and expanded applications of Bessemer steels as well as extended explorations in the actual production of this type of steel. Probably when the history of this war is written from a steelman's viewpoint it will be found that Bessemer steels more than did their part when steel was short.



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
July 13	92.0	99.0	95.0	98.5	93.5	104.5	98.0	97.0	101.0	94.5	98.0	99.0	83.0	96.0
July 20	91.0	101.0	95.0	98.5	96.0	104.5	96.0	97.0	98.0	95.5	98.0	99.0	94.0	96.5

OWI Photo by Palmer in an Allegheny Ludlum plant

AMERICAN TREASURY... THIS YEAR'S STYLE

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Instructional films on tool and stainless steels—some in full color, all with sound—available for free showings by companies, trade & industrial groups, student training courses, technical schools and colleges, etc., upon request.

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ADDRESS DEPT. IA-28

THOSE slabs and billets of special high-alloy steels, awaiting further processing in Allegheny Ludlum plants, are raw materials for the world's finest mechanical equipment. They're also the main reason *why* it's the finest. Special steels give the extra performance—the superior electrical properties, or strength and toughness, or resistance to heat, wear and corrosion, as the case may be—that gives one product the edge over another.

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Allegheny Ludlum
STEEL CORPORATION
BRACKENRIDGE, PENNSYLVANIA

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Reconversion Developments of the Week

Washington

• • • **Dramatic developments** relating to reconversion occupied the forefront of industrial attention last week with the following actions taking place:

1. Undersecretary of War Robert P. Patterson and high naval sources categorically denied that there is 10 per cent or more "water" in war production or that contract cutbacks and terminations are being held up until after election day. That the Services have been deliberately inflating military requirements and holding up terminations for political reasons to maintain high level pre-election employment has been strongly rumored recently in production centers.

Mr. Patterson said that war production is lagging 8 per cent, or more than $400,000,000.

2. Admiral Emory S. Land, Chairman of the Maritime Commission, told THE IRON AGE that a new maritime program of 8,000,000 deadweight tons of shipping has been approved by the President and the Joint Chiefs of Staff for construction in the first half of 1945.

Private shipping experts have been critical of the Maritime Commission program and have asserted that so many ships have been built beyond war needs the Commission must be building a postwar merchant fleet. When asked about this point Admiral Land said: "We are building a Joint Chiefs of Staff fleet."

3. T. P. Wright, Director of the WPB Aircraft Resources Control Office, denied that there is any huge impending cut contemplated for military aircraft before the defeat of Germany, as some other high WPB officials have alleged. Assistant Secretary of the Navy Artemus Gates said that all foreseeable cuts in Naval aircraft construction for the remainder of this year have been made.

4. The War Department decided to start immediate preparation of preliminary plans for cutting military programs. The War Department will present to the Production Executive Committee on July 20, a plan for terminating war contracts as soon as Germany surrenders. By July 20 it is expected that the department will submit definite recommendations on how far programs should be cut and how cutbacks will affect important

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By DONALD BROWNE
Washington Staff

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war production centers and cities. Not long after this, it is expected that individual company termination notices will be ready for transmittal, as soon as the first flash of victory comes.

5. Leading automobile executives met with war agency officials and rejected WPB plans to make 2,150,000 passenger cars when resumption is permitted. The auto men also discarded the too cumbersome WPB "blue order" plan which proposed that manufacturers place tentative orders as soon as production quotas are assigned to each.

• • • The dates on which WPB will put into effect its reconversion orders were announced by WPB Executive vice-chairman Charles E. Wilson. The dates on which the various parts of the program go into effect are:

1. July 15—Lifting of restrictions on use of aluminum and magnesium.

2. July 22 — Permission to make experimental models.

3. July 29 — Permission to order new machine tools and equipment.

4. August 15—Limited reconversion upon application of manufacturers with the provision that manpower, materials and capacity are available and that the production will not interfere with military needs.

K. T. Keller, president of Chrysler Motor Co., told THE IRON AGE that to resume production about 50 per cent of the war contracts would have to be removed from the Detroit area. Mr. Keller indicated that the Army has recently placed many highly complicated production jobs in the area and with the shortage of engineers no production is feasible until Germany is defeated. It is assumed that the foregoing War Department X-Day plans will provide for withdrawing this much military production from Detroit.

"If the military equipment in the European theater was good enough to defeat the Germans, it can certainly be used against the Japanese," Mr. Keller declared in commenting upon the question of using shipping and military supplies now being employed in Europe. Re-using military equipment and ships will lessen the demand for increased war production to fight the Japanese and is expected to free capacity for civilian manufacture.

Automobile men said that the steel industry does not want to immediately furnish steels of the specifications sold before the war and are offering steels developed during the war which the automotive industry has not had an opportunity to test. It was said that many thousands of hours of research would have to be devoted to finding out how the new steels will stand up. One automobile executive added that the steel industry has plenty of orders now, but there would be a time when it would be glad to furnish without protest what the automobile companies want.

Of equal concern are machine tools, it was said. Approximately 7500 new tools, or one months' production of the tools industry will be needed in reconversion. The industrialists said that the automobile industry could secure an additional one fourth of its needs by purchasing government-owned tools.

Hinckley Chosen for New Post

Washington

• • • **Given the important** job of seeing to it that claims for huge war contracts when terminated are quickly settled so that industry will be enabled financially to turn to reconversion has been assigned to Robert H. Hinckley, former Assistant Secretary of Commerce, who resigned that position in 1942 to become vice president of the Sperry Corp., maker of gyroscopes and other precision implements for war ships and airplanes.

Mr. Hinckley was chosen by the President to be Director of Contract Settlement. His appointment is subject to Senate confirmation. As Director of Contract Settlement Mr. Hinckley occupies a vital post in domestic demobilization.

Users of WPB's "Spot Check" Plan Must Get Steel Division Approval

Washington

• • • **Wherever flat rolled products,** malleable and gray iron castings or stainless steel are involved, the applications of manufacturers seeking to take advantage of the WPB regional or "spot check" reconversion plan, must be transmitted to the WPB Steel Division for approval with the recommendation of regional WPB officials.

The plan to be issued on Aug. 15 also required Washington approval for all products under authorized OCR programs contained in the summary of essential civilian durable goods issued on June 17 which require components on List A of the new order.

WPB regional offices and area production urgency committees will have the sole responsibility for approving applications for concerns employing less than 50 in group 1 labor areas, less than 100 in group 2 labor areas and less than 250 in group 3 and 4 labor areas. Whenever an applicant exceeds these manpower limitations, his application will be forwarded to Washington for approval by appropriate manpower authorities.

Officials expect the plant to utilize idle and excess steel stocks for the present but if unused allotments or other reserves become available, they may be devoted to non-military production.

Despite the fact that Army and Navy officers have the right to make recommendations to the Area Production Urgency Committee and to the various WPB industry divisions, they do not have a veto power.

If the regional offices and a majority of the APUC members find that manpower, plant capacity and material are available, Army and Navy representatives will not be able to stop resumption of civilian production at the local level. Similarly, industry divisions will have the final say in Washington, with the exception that appeals may be taken to the WPB.

The fact that the services have no veto power under the plan is said to form the basis for their opposition to issuance of the order on Aug. 15. The plan carries the general approval of war mobilizer James F. Byrnes, and it is said, also of the President.

Contracts Have Been Awarded For Construction of 262 Additional Ships

Washington

• • • **At the urgent request** of the Joint Chiefs of Staff, contracts have been awarded for the construction of 262 additional ships, the United States Maritime Commission has announced. All of these vessels, it was stated, are vitally needed for the prosecution of the war and all must be completed before July 1, 1945, to meet the constantly expanding requirements of the armed services. Included in the contracts are 174 Victory ships, 30 ships of the C-1 type, 15 vessels of the C-2 type, seven large tankers and 36 coastal cargo ships.

Contracts for additional 10-500 deadweight tons Victory ships have been awarded to the Oregon Shipbuilding Corp., Portland, Ore., for the construction of 20; to the Permanente Metals Corp., Shipbuilding Division, Richmond, Cal., for the construction of 65; to the California Shipbuilding Corp., Wilmington, Cal., for the construction of 45, and to the Bethlehem-Fairfield Shipyard, Inc., Baltimore, for the construction of 44 Victory type vessels. The Commission has now contracted for a total of 520 Victory ships.

Contracts were awarded for construction of 5000 deadweight ton ships of the C1-M-AV1 type to the Pennsylvanis Shipyards, Inc., Beaumont, Tex., for four, and 26 to the Consolidated Steel Corp., Ltd., Wilmington, Cal., for 26 such vessels.

A contract was awarded to the North Carolina Shipbuilding Corp., Wilmington, N. C., for the construction of 15 additional C-2-S-AJ1 type vessels of 9700 deadweight tons each.

A contract was made with the Alabama Dry Dock & Shipbuilding Co., Mobile, Ala., for the construction of seven large tankers of the Commission's T-2 type. Contract for eight of these tankers to be built by the Marinship Corp., Sausalito, Cal., was announced on July. 12.

AUSTRALIAN FIGHTER: *French children crowd around a Spitfire fighter plane at an airstrip in the Normandy beachhead sector. Fighter is one of a squadron of the Royal Australian Air Force that arrived from England to aid in maintaining air support for Allied ground forces.*

Announce Development of New Motor Lubricant Using Sand as Base

New York

• • • **What a saboteur** would grab to throw into the gears of a piece of machinery might very easily be a handful of sand. Yes, a handful of silica would do very nicely to slow up a machine tool, yet last week, W. R. Collings, vice-president and general manager of Dow Corning Corp., Midland, Mich., subsidiary of Corning Glass Works and the Dow Chemical Co., announced here that his company was using silica (sand) as one of the basic components in the manufacture of a new lubricant for motors and machine tools.

Mr. Collings explained that the radically new line of liquid and solid "silicone" materials, including products for lubricating and insulating many types of motors and machine tools was the result of a "century of research" by the company to utilize silicon and oxygen in the production of new temperature resistant materials.

After announcing the recent results of Dow Corning's silicone chemistry program, the Michigan executive exhibited samples of most of the silicones now available commercially, including "fluids" for use in insulation, hydraulic equipment and lubrication; greases for special purposes and resins for insulating and laminating glass or asbestos cloth to produce non-carbonizing board. Twelve viscosity grades are for use in the temperatures as low as 70 deg. below zero F. or to 500 deg. F. above zero.

Exhaustive tests by engineers of the Westinghouse Electric & Mfg. Co. have brought reports of unusual success in the use of silicone insulating materials. One of the high temperature silicones for electrical insulation is a coating and impregnating varnish which may be applied to Fiberglas cloth, asbestos cloth or other materials.

On motor applications, Westinghouse engineers found the new insulation greatly increased power, the rate of increase being more than 200 per cent on one design of a 3 hp. motor. Exhaustive tests were made on a 250 kva., 440 volt, generator with the new high temperature insulation. After approximately 3000 hr. at 482 deg. F. operating temperature the insulation still was in excellent condition. Normally such generators operate at 266 deg.

Start Work on 106 By-Product Ovens

Pittsburgh

• • • It was announced this week that construction of 106 by-product coke ovens, estimated to cost $7,500,000 was started at the Jones & Laughlin Steel Corp.'s Aliquippa, Pa., works.

The new ovens will increase J. & L.'s metallurgical coke capacity by about 59,000 tons a month, representing a 50 per cent increase in the coking capacity of the Aliquippa Works and a 20 per cent increase in the corporation's overall coking facilities. The project is expected to be completed in 14 mo. with The Koppers Co. of Pittsburgh handling the contract.

In addition to producing the increased coke to be used as fuel in blast furnaces, the company will recover large additional quantities of by-product chemicals. These included benzol and tar products for making munitions, paints and plastics; medicines, such as sulfa drugs, and fabrics such as nylon. Existing J. & L. by-product recovery equipment, with some slight addition, has the capacity to handle the increased flow of by-products.

BACKING THE ATTACK: *Workers in the U. S. Steel's Federal shipyard at Kearny, N. J., cheer the news that the V-Drive crusade has succeeded to the tune of* $2,100,000. *Their record:* $30,500,000 *in war bonds and* 187 *ships since Pearl Harbor.*

Schedule Review Asked

Washington

• • • **A special letter** has been addressed by WPB program vice chairman S. W. Anderson to a selected list of large users of carbon steel who reported sizable inventories, directing them to review the demands of their current production schedules, reduce inventories of all carbon steel products to minimum working levels, and to cancel immediately outstanding purchase orders for the maximum possible tonnage of carbon steel.

Mr. Anderson said that the unprecedented production effort now being made to meet invasion requirements has brought the demand for carbon steel products to a level in excess of supply. It is therefore imperative, he said, that all major users of carbon steel examine outstanding purchase orders in terms of their minimum current needs. Unless this is done promptly, there is serious danger that certain essential military requirements for carbon steel may not be met, Mr. Anderson said.

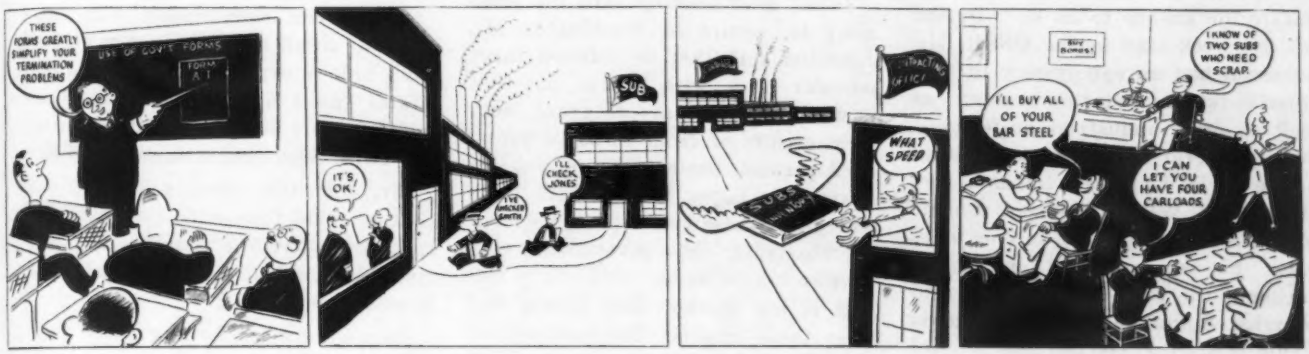
War Department Illustrates The

• • • Start with Panel No. 1 which is directly below. Here we see how the obsolete weapons used early in the war were ineffective and how it was necessary to change to modern armor. To do this the old contract had to be terminated and a new one drawn up for the modern weapons. Work on the old contract had to stop; work on the new begun. Finally we see how the new contracts bring about the defeat of the enemy more effectively. In No. 2 we see various things that can be done before termination, such as reading over the War Department's CONTRACTORS' GUIDE which may be secured from the War Department; the appointment of an executive to manage the termination; the careful watch on inventories; and the segregation of U. S. Government items in your stock. In No. 3 we see the first job of the Termination executive; how the contractor gets together with the termination men from the Army Procurement Office; how he talks the matter over with his sub contractors; and how he must be sure the subs understand everything. In No. 4 we see that the contractor must always be on the alert for the news that he must terminate his contracts at once;

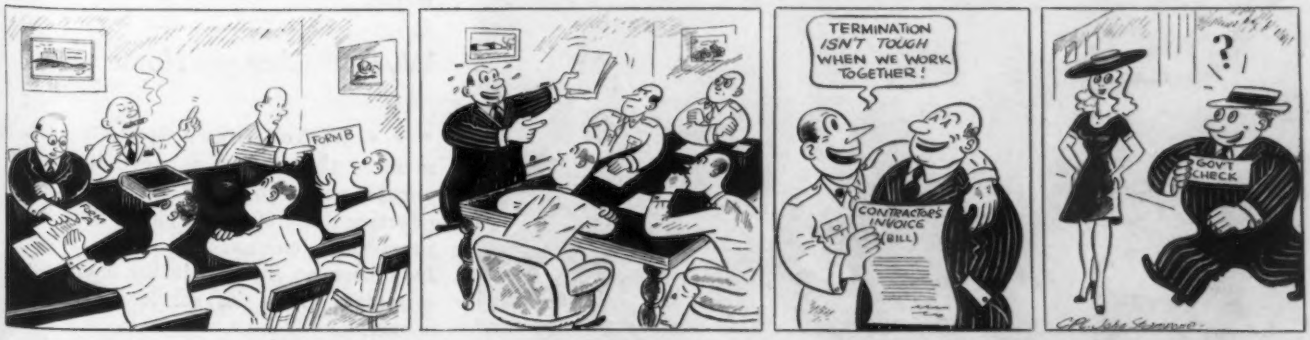
HERE'S A JOB FOR YOU, BOB
CONTRACTOR
TERMINATION INVOLVES SOME SPECIAL STUDY THAT THE GOV'T PROVIDES.
GOV'T TERMINATION SCHOOLS
KEEP DOWN THOSE INVENTORIES
U.S. GOV'T PROP.

"How" of War Contract Termination

how the Stop-Work order goes out on receipt of the Notice of Termination; how the work must actually be stopped to save time and money; and how all subs must be terminated together with current purchase orders. Remember speed is the primary factor at this point. On this page, in No. 5 we see how a bottleneck can result if the subs do not take inventory promptly; how the subs' inventories should be examined and reviewed; how you should cooperate with the government in making every effort to dispose of excess property. In No. 6 we see how a number of steps should be taken simultaneously; how a meeting should be held to expedite this; and how the various inventories, including the prime contractor's, may be expedited by following government regulations. In No. 7 we see how excess property may be removed and stored for 60 days from the time you submit an inventory list to the contracting officer and how you must give him notice. And finally in No. 8 we see how the terminated contracts are settled by negotiation in most cases; how an invoice must be submitted on which the final payment is made. The whole story stresses the necessity of the contractor becoming adept at his part of the job.


THESE FORMS GREATLY SIMPLIFY YOUR TERMINATION PROBLEMS
USE OF GOV'T FORMS
FORM A-1
SUB
IT'S OK!
I'LL CHECK JONES
WHAT SPEED
I'LL BUY ALL OF YOUR BAR STEEL
I KNOW OF TWO SUBS WHO NEED SCRAP
I CAN LET YOU HAVE FOUR CARLOADS

I CAN USE SOME OF THAT EQUIPMENT
HOW ABOUT STORAGE SPACE?
WE NEED A TIME SCHEDULE FOR THIS SETTLEMENT
SOUNDS GOOD TO ME
SURE WE CAN ARRANGE PARTIAL PAYMENT
WHAT DO YOU THINK OF THE FORMS AND THE GUIDE
BE SURE THEY'RE SECURE
MARK FOUR BARRELS OF THESE MAC
OK
EQUIPMENT
RAW MATERIALS



Stalin Says Russia Will Produce 11,000,000 Tons of Steel This Year

Washington

• • • **Eric Johnston**, dynamic president of the United States Chamber of Commerce, told THE IRON AGE last week that "it is not possible to compare Russian steel production with that of the United States and it is unfair for anyone to do so." During his five-week stay in the USSR, Mr. Johnston had an opportunity to visit Russian steel production centers as well as other industrial projects.

His general views of steel output of the Soviet Union are in sharp contrast with WPB Chairman Donald M. Nelson's statements to the press after his shorter stay in Russia earlier in the year. Mr. Johnston said Marshal Stalin told him that Russia would produce 11,000,000 tons of steel this year. With a population of about 60,000,000 less, the United States now has a steel capacity of 93,653,000 tons. However, he paid great tribute to the individual mill worker, particularly women in the mills. According to Mr. Johnston the world owes a debt of gratitude to the Russian working woman that it will never be able to repay.

In his trip through Russia Mr. Johnston said that Marshal Stalin told him that after the war two five-year plans will be put into operation and at their conclusion Russian steel capacity will be about 60,000,000 tons annually. One of the Russian steel cities, behind the Ural mountains, will be larger than Gary, Ind. when completed. It was started 10 years ago. At present steel is Russia's most highly developed industry.

In his first meeting with the press after his return to Washington Mr. Johnston said that he foresaw large postwar trade with Russia, but that it would be necessary to grant long-term credits of from 10 to 30 years, if American business is to get its share. He hopes that private firms will grant these credits, but held out the possibility that government may have to take a hand.

It is his opinion that Russia will meet these credits. He pointed out that the United States could accept payment in Russian natural resources, such as copper, manganese, tungsten, platinum, cobalt, nickel, timber and even some agricultural products. Pure barter was discussed while Mr. Johnston was in Russia, but he does think it will be necessary to revert to such a system.

Russia needs much from America for rehabilitation purposes, among the most critical needs are mining machinery, industrial machinery, railroad equipment, hydro-electric equipment, machinery to turn out consumer goods, roadbuilding equipment, ships and automotive equipment. Marshal Stalin says that it will be necessary to double existing railroad capacity in the Soviet Union.

According to Mr. Johnston, there will be little demand for American consumer goods, although the need is great, since Russia expects to go into consumer goods production on a hitherto unparalleled scale for that country.

The Soviet Government will continue to do all purchasing, for rather than any return to what the United States knows as normal business relations, there is an intensification of the collectivist system in the USSR.

Mr. Johnston strongly emphasized that he could foresee no international competition with Russia in his lifetime, because of the immensity of Russia's own needs.

Russia's desires for a greatly augmented merchant marine in the postwar world are solely for her own needs, said the Chamber head.

He was quick to point out that Russia still has much to learn from the United States in production methods, utilization of labor and technological processes. A trade union movement exists, but its very nature makes it compulsory and completely unlike anything that exists in this country. Piece work is almost universal in Russia.

Although Mr. Johnston told the Russians that the American way was not compatible with communism and that the United States wanted no interference from communism, he told newsmen that he saw no reason why America and Russia could not engage in friendly trade relations after the war.

Despite rumors that he had political ambitions, Mr. Johnston would not commit himself on future plans beyond saying that he intended to finish out his present term as president of the United States Chamber of Commerce.

THIS WAY OUT: *Over 60,000 tanks and mechanized military vehicles have channeled through the Lima (Ohio) tank Depot on their way to the fighting fronts. This picture of a very small area of the shops shows tanks being fitted out with On Vehicle Material and being given any modifications necessary for their ultimate destination.*

Wyckoff Changes Name

Pittsburgh

• • • **Wyckoff Drawn Steel Co.**, announced that it had changed its corporate name to Wyckoff Steel Co., effective June 30. Joseph T. Somers, president, emphasized that there have been no changes in the company organization, or its services or personnel.

Summary Gives First Detailed List Of Lend-Lease Deliveries to Russia

New York

• • • **The first full and** detailed list of lend-lease deliveries to Russia ever to be published in this country or in Russia appeared in a statement issued recently by the Commissariat of Foreign Trade in Moscow. From this statement the Russian people have learned the full extent of the aid given them by their Western Allies since the beginning of the Russo-German war up to April 30, 1944.

In the tables below the figures given by the Commissariat of Foreign Trade have been re-arranged and grouped under five separate headings:

1.—READY-MADE WEAPONS AND AMMUNITION

	(numbers) United States	Great Britain	Canada
Aircraft	6,430	5,826*	.....
Tanks	3,734	4,292	1,188
A.A. guns ..	3,168	562	.....
Oerlikon guns	1,111	.....	.....
Anti-tank guns	.....	548	.....
Minesweepers	10	12	.....
Big-U-boat chasers ..	12	.....	.....
Torpedo cutters and small U-boat chasers ..	82	.....	.....
Devices for detection of U-boats ..	.....	116	.....
Shells	22,400,000	17,000,000	827,000
Cartridges ..	991,400,000	290,000,000	34,800,000

*2,442 of these were dispatched from the U. S. A.

On balance, the British lend lease supplies of readymade weapons have been of the same order as, or not very much less, than the American supplies. Only in the case of cartridges have the Americans delivered more than three times the quantity despatched from Great Britain to Russia.

The figures in the next table provide a striking contrast. In means of transport and communication practically the whole contribution has come from the United States.

2.—MEANS OF TRANSPORT AND COMMUNICATION

	(numbers) United States	Great Britain	Canada
Lorries (including armored troop carriers)	212,168	5,239	3,410
Motorcycles	17,017	....	....
Telephones	245,000*	....	....
Locomotives	241	....	....
Platform cars	1,154	....	....
Artillery wireless installations	....	214	....

*Plus 1,229,000 km. of field telephone wire.

In the table of strategic raw materials the Unied States heads the list; but the British and Canadian contributions are also very impressive. Some of the items in this list, for instance, copper and steel include also semi-manufactured articles.

3.—STRATEGIC RAW MATERIALS

	(in tons) United States	Great Britain	Canada
Aviation fuel ...	476,000	....	....
Rubber	....*	103,500	....
Aluminum	99,000	35,400	36,300
Copper	184,000	33,400	23,500
Zinc	42,000	7,400	6,700
Nickel	6,500	2,700	1,300
Steel (incl. rails)	1,160,000	....	13,300
Tin	....	29,400	....
Lead	....	47,700	9,100
Cobalt	....	245	....
Jute, sisal, etc...	....	93,000	....
H.E.	217,900	17,300	5,000

*The United States delivered more than 2,000,000 tyres to Russia.

The total quantities of light metals delivered to Russia were one and a half or two times as large as Russia's own output of those metals in the last pre-war year, that is, in 1940. The deliveries of aluminum have been more than twice as large as Russian domestic output in that year.

In industrial equipment Great Britain has led in delivering power plant equipment and electric motors, while the United States has come first in metal cutting lathes and heavy machinery.

4. INDUSTRIAL EQUIPMENT

	(numbers) United States	Great Britain	Canada
Power plant (in kilowatts)	327,000	374,000	....
Electric motors	....	15,084	....
Metal cutting lathes.	20,380	6,491	....
Ship engines	4,138	....	....
Oil refineries	4	....	....
Aluminum rolling mill	1	....	....
Presses and hammers	2,718	104	....
Cranes	524	24	....
Exc vators	209	....	....
Diamonds (value in £)	....	1,206,000	....

5. CLOTHING AND FOOD

	United States	Great Britain	Canada
Army boots (pairs).	5,500,000*	....	....
Army cloth (yards)	22,800,000	....	....
Foodstuffs (tons) ..	2,199,000	138,200	208,600

*American sources give the figure of 7,500,000 pairs.

The difference in the number of boots given by American and Russian sources—amounting to 2,000,000 pairs—is probably explained by the fact that the Americans count among the deliveries the goods lost on the way through enemy action. The following table shows the total tonnage of the goods despatched from each country and the tonnage of goods received in Russia.

....	United States	Great Britain	Canada
Despatched	8,500,000	1,150,000	450,000
Received in Russia.	7,400,000	1,041,000	355,000
Presumable losses .	1,100,000	109,000	95,000

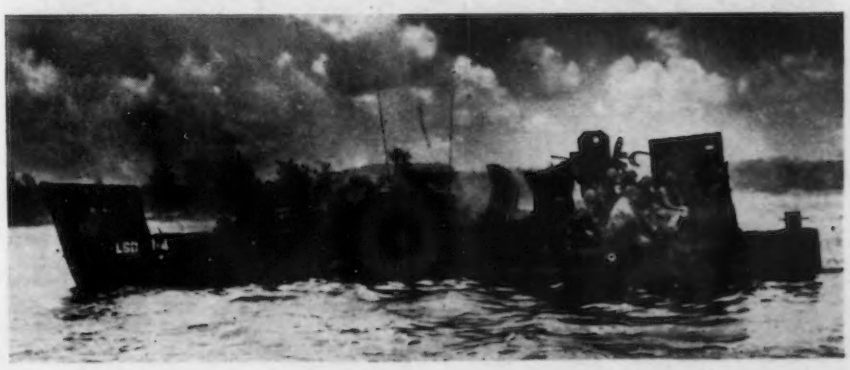
It is interesting to compare the quantities of goods received in Russia year by year since the beginning of the Russo-German war up to the end of last April.

	United States	Great Britain	Canada
	(in tons)		
1941 ..... }	1,200,000	158,000	....
1942 ..... }		375,000	125,000
1943	4,100,000	304,000	124,000
1944 (up to April 30)	2,100,000	144,000	106,000

The table illustrates the great importance of British and Canadian deliveries in the first period of the Russo-German war when the United States could not yet supply Russia on the scale which its supplies assumed later on. American deliveries show a steep increase in 1943, the year in which British deliveries decreased. In the first four months of this year the tonnage of American deliveries was more than half of last year's. On May 1st, 684,000 tons were on the way from the United States, 44,000 tons from Great Britain, 60,000 tons from Canada to Russia.

The United States have made their deliveries on the basis of the Lend-Lease Act. The total value of the supplies despatched from the United States is given at 5,357 million dollars, while the value of supplies received in Russia is given at 4,612 million dollars. Of the British supplies 319,000 tons of armaments were

LANDING BARGE BASHED: ***Off Saipan, a landing barge catches a barrage of mortar fire which scored a direct hit on the vessel. Note smoke curling up from amidships as Coast Guard boat rushes up to give assistance.***



despatched without payment as military aid; and that part was certainly the most valuable since the bulk of it consisted of ready made arms. The rest of the supplies, consisting of raw materials, industrial equipment and food, were delivered partly on credit and partly for cash payment; and their value is given at £83,700,000. The total value of Canadian supplies amounts to 187,600,000 Canadian dollars, of which supplies worth 116,600,000 were delivered before a separate agreement on credit was concluded between Russia and Canada.

It is also interesting to compare Allied aid with Russia's own war production. Naturally enough, the facts about Russian production have not yet been published. But there can be no doubt that the Lend-Lease deliveries have formed a high proportion of the weapons and materials used on the Eastern Front.

However, the Russian industries were this time incomparably better prepared to meet the needs of the armies in the field than they were in 1914-1917; and — similarly — the present abundant flow of Allied supplies to Russia has provided a striking contrast with the lack of Allied response to the Russians' desperate demands for weapons throughout the last war. In 1915, a British military observer in Russia wrote about one of the Russian leading military personalities: "He has trusted too much to the promises of Vickers and Creusot, whose failure has upset all calculations. . . ." No such words could have been written from Moscow in recent years.

Labor Committee Offers Solution To Serious Lag in Steel Production

Washington

• • • **Renewing the old** CIO insistence upon Government-labor-management committees to work on industry problems and asking for increased pay for unskilled employees, the Steel Labor Advisory Committee, consisting of nine United Steel Workers union members, at a meeting last Friday presented these suggestions to WPB as a solution to lag in steel production.

Labor spokesmen, challenging claims made a week earlier by the Steel Industry Advisory Committee, said that the manpower shortage is not genuine. They contended that the chief manpower bottleneck lies in the inability of steel plants to obtain sufficient unskilled and semi-skilled workers to do cleanup work on furnaces. Instances were cited, according to a WPB statement, to support the claim that manpower can be obtained for the unskilled and semi-skilled work in the industry if, in recognition of the critical need to boost steel output, an emergency arrangement is worked out so that the needed labor will be attracted to the industry.

The labor representatives declared that, when unable to attract unskilled workers at existing rates, some steel plants have successfully called upon contractors to handle the necessary work. They said the contractors then obtained workers at higher wages than are paid in the steel plants. The labor spokesmen added that a similar solution could be achieved if the plants themselves could, "on an emergency basis," raise the unskilled pay instead of contracting with outside labor suppliers to come in and provide the needed workers.

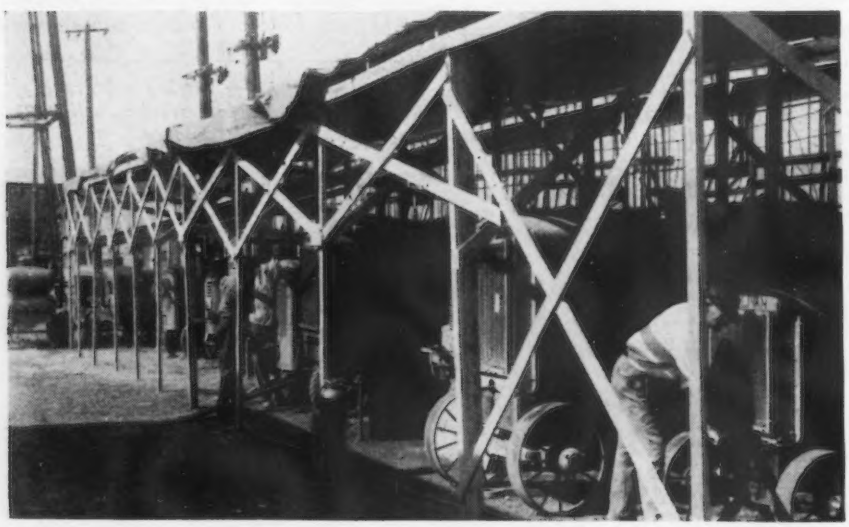
It was also contended that a much more efficient utilization of the overall labor force in most plants would largely obviate the manpower shortage. Specifically, the Committee said that skilled workers can be used on an emergency basis to perform most of the unskilled jobs if arrangements can be made with the plants to pay their regular rates to skilled workers who volunteer to perform unskilled jobs. Contention was likewise made that in some cases the full productive facilities in the industry are not being utilized to maximum capacity.

Norman W. Foy, WPB Steel Division director, who presided at the meeting, pointed out, however, that there are some facilities not being operated at capacity because of their inability to produce types of steel products usable and required in the war effort. Committee members said that the use of more shifts in some cases would enable the plants to increase output considerably and thus assure more efficient use of the existing labor force, both skilled and unskilled. They also contended that output could be increased in some plants by operating on holidays.

In strongly recommending the creation of a Joint WPB-Labor-Management Committee to meet regularly to tackle production and man power difficulties, the Committee expressed the conviction that constant interchange of suggestions on all sides is necessary to effectively improve production. It was declared by Committee spokesmen that, in many instances, management is not aware of the real causes of production lags, and that labor's recommendations for corrective action can be of value to the industry and to the war effort.

Responding to the Committee's proposal, WPB representatives pointed out that channels have been provided for transmission of information and suggestions from labor unions to WPB through the offices of the vice

MOBILE COMPRESSORS: ***All but four of the 15 mobile compressors shown in this circus-like "lean-to" beside the American Central Manufacturing Corp.'s plant at Connersville, Ind. are now in operation 20 hr. a day. The extended hours approximately trebles their normal 8 hr. stint in road construction.***



chairman for Manpower Requirements and the Vice Chairman for Labor Production. The WPB representatives urged use of these channels.

It was agreed that labor organizations will submit immediately to WPB a formal list of suggestions about production improvements and also about methods of solving manpower difficulties which exist in many plants. WPB in turn will supply to labor organizations a constant flow of information concerning particular plants that are having difficulties in meeting production schedules, so hat suggestions of labor can be directed particularly to the plants and areas which are in difficulty.

WPB Executive Vice Chairman Charles E. Wilson and representatives of the Army, Navy and Maritime Commission told the Labor Advisory Committee that expanded military requirements will call for increased tonnage of steel in the fourth quarter of 1944 and in the first and second quarters of 1945.

As an example of the reasons behind the upward revisions of steel requirements War Department representatives told the Committee that General Dwight Eisenhower has informed General George C. Marshall, Army chief of staff, that stronger resistance from improved German armored equipment is requiring increased use of American tanks, guns and other offensive equipment. Other war equipment for which more steel will be required, it was pointed out, are heavy artillery, pipe, shell containers, shipbuilding and aerial bombs. The peak in the steel requirements schedule, the committee was informed, will come in October and November.

Test Triple Alloy for Screws

Washington

• • • **WPB told the Socket Screw** Industry Advisory Committee at a recent meeting that the use of triple alloy steel in the production of socket screws is still in the experimental stage. Three companies are now conducting tests to prove the practicability of using triple alloy steel in recessed head screws and bolts. Committee members stated that the industry as a whole will abide by results of the experiments. Until the tests are successfully concluded, however, the members asked that they be permitted to use the 4037 series (single alloy steel).

AUTOMATIC SHELL INSPECTOR: *In top photo, girls load 155 mm. shells onto motorized ring outside of the X-ray exposure chamber of high-powered X-ray equipment used at Milan Ordnance Center, Milan, Tenn., for detecting flaws in shell powder loading by radiograph. A million volts pass into the General Electric X-ray unit (center photo) in the exposure room which produces a radiographic image of the shells and contents on individual films. Directly above is a reproduction of the X-ray plate which shows excessive cavitation (arrows) in the explosive pour of TNT within the shell.*

General Steel Production Hinges On Flat Rolled and Shell Steel Needs

Pittsburgh

• • • **The entire outlook** of steel seems to hinge primarily on two specific steel categories, flat rolled and shell steel. These two items, while covering a variety of the steel industry's mills, are by far the two major groups from which steel is being drawn today. Consequently, both of these classes are carrying over on production far into succeeding months and are forcing other products into the carry-over brackets.

Plates, by reason of their criticalness in Naval and Maritime construction, are forcing sheet and strip demands off the mills. Shell steel, a more or less general term with a specific meaning, now makes and will continue to make it impossible for consumers of structural materials, rails, hot rolled bars, rounds in the larger sizes such as used for seamless tubing, and semi-finished steel in the form of blooms and billets, to get necessary supplies of these items.

Superimposed on the capacities for production of these items are two major factors that restrict capacity operations of their production facilities. The first is manpower. Manpower includes the availability of the required help to operate facilities that already exist for production of these products, the fact that already employed help stays away from the job during the warm summer months, and the general relaxations of production that comes with hot weather. The second, peculiar to a period of war production, is the tendency of both the WPB and steel producers to sacrifice maintenance for production.

Much has already been said and printed about the manpower situation and its criticalness. There are now many phases of the production picture that could be far easier and production could be at better rates if necessary manpower was available. Blast furnaces, open hearths, plate mills, and many other steel-making facilities would be working at higher rates of production if more manpower was available. If the desired experienced manpower was available, even greater production would be achieved.

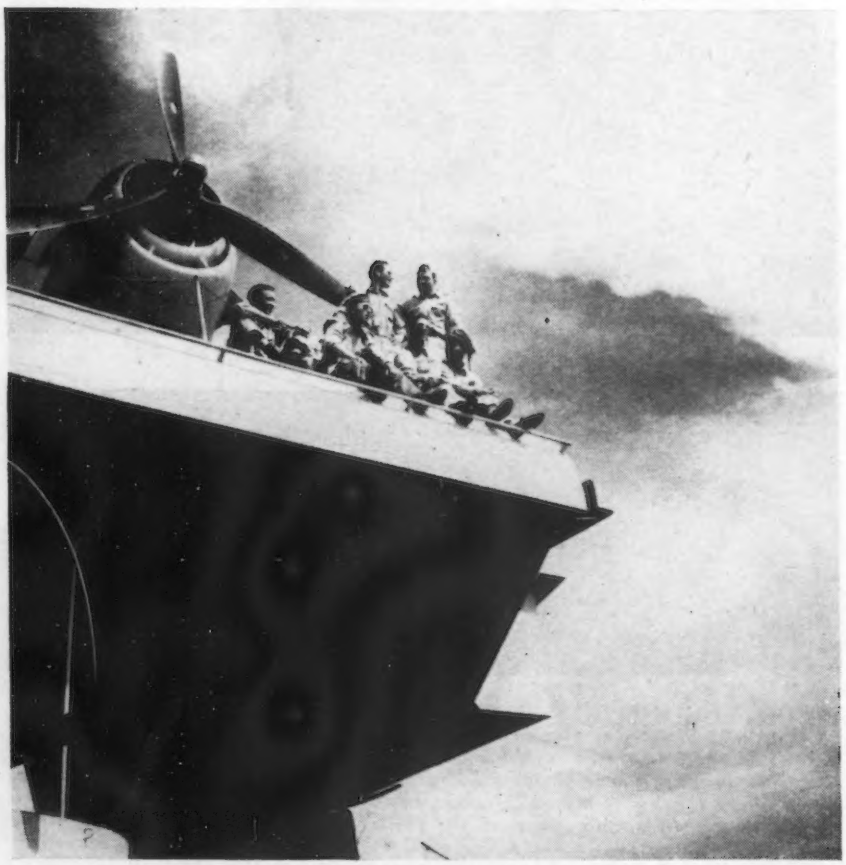
On the side of maintenance, there appears at present to be an inclination to run facilities to the breaking point. The reasoning behind this points only in one direction—a quick victory in Europe. In other words, if equipment of war manufacturers is sacrified now, a quick victory in Europe will result, and after that maximum production will no longer be the order of the day and any time necessary will be available to replace or repair equipment.

Such thinking, if it is the basis for the present drive for production, could not stem from the WPB alone, but must by reason of its far reaching effects come from the War Department, Navy Department, and other agencies directly involved with the prosecution of the war. WPB in itself could not know of such conditions unless advised by such agencies. Furthermore, the recent statements of Britain's prime minister, Winston Churchill, and other men in a position to know the full implications of the present European situation, plus the fact that Allied armies are progressing on all fronts in Europe, indicate that a quick victory in that theater of war is not only possible but quite likely.

While there is a tendency in this country toward over-optimism, it might be that at present there is a holding back of optimism over the European campaign. It doesn't require a seer or a ouija board to show that if the Russian campaign continues at its present rate, Germany itself will be the battleground in another month or so on more than one front, and it is anyone's guess what will happen in Germany if fighting progresses to German soil.

Steel-wise and war production-wise, such a feat will require vast amounts of materials quickly and then requirements will be curtailed drastically. The effort of WPB and other government agencies for immediate production at the expense of maintenance of equipment might well point to just one fact—the Nazi participation in the war is no longer a matter of months away, but only a matter of weeks. Consequently, it is necessary to avoid a situation of "too little and too late" by putting the finished war materials at the disposal of the fighting forces immediately. After victory, internal difficulties will overnight be converted to mere operating problems.

GRANDSTAND SEAT: *Naval officers station themselves on the "leading edge" of the flight deck to enjoy the view as the flat-top makes for a port somewhere in the South Pacific. For once the boys seem to be taking it easy.*



Concerns Expanded for Increased Output of 155 mm., 8 in., 240 mm. Shells

Washington

• • • **Affecting practically** all ordnance ammunition loading plants and chemical and explosive works, the following 58 concerns are being expanded by the addition of approximately $100,000,000 worth of machine tools, presses and furnaces to fill contracts they have just been awarded in connection with the Army program for increased production of 155-mm., 8-in. and 240-mm. shells:

Altorfer Bros., East Peoria, Ill.; War Supplies Ltd. (Northern Engineer & Supply Co.) Port Arthur, Ontario; Pullman Standard Car Mfg. Co., Butler, Pa.; American Mfg. Co., Fort Worth, Tex.; National Cast Iron Pipe Co., Birmingham, Ala.; Willey's Overland Motors Co., Toledo; W. F. & John Barnes, Rockford, Ill.; Giddings & Lewis Co., Fond du Lac, Wis.; Minneapolis-Moline Power Implement Co., Minneapolis; Atlas Imperial Diesel Engine Co., Mattoon, Ill.; General Motors Co., Oldmobile Division, Lansing, Mich.; Babcock Printing Press Co., New London, Conn.; Treadwell Construction Co., Midland, Pa.;

Omaha Steel Works, Omaha, Neb.; Mueller Co., Decatur, Ill.; Goslin Birmingham Mfg. Co., Birmingham, Ill.; Gullett Gin Co., Amite, La.; Rockwood Alabama Stone Co., Russellville, Ala.; Central Foundries, Holt, Ala.; G. I. Case Co., Racine, Wis.; General Motors Co., Body Division, Grand Rapids, Mich.; General Motors Co., Pontiac Motors Division, Pontiac, Mich.; Rheem Mfg. Co., Danville, Pa.; United Engineering & Foundry Co., New Castle, Pa.; U. S. Hoffman Machine Co., Syracuse, N. Y.; Kaiser Co., Inc., Shell Division, Oakland, Calif.;

Reed Roller Bit Co., Houston, Tex.; Hughes Tool Co., Houston, Tex.; Le Tourneau Co., Toccoa, Ga.; Pottsville Casting & Machine Co., Pottsville, Pa.; York Electric & Machine Co., York, Pa.; Lehigh Foundries, Inc., Eastern, Pa.; American Well & Prospect Co., Corsicanna, Tex.; General Power Co., Quapaw, Okla.; Unit Rig Co., Tulsa, Okla.; Long Reach Machine Co., Houston, Tex.; Bagley-Sewall Co., Watertown, N. Y.; Florence Stove Co., Kankakee, Ill.; Fred I. Getty, Jennings, La.; Leach Machine & Boiler Works, Houma, La.; Ridgewood Steel Co., Cincinnati;

Navy Bureau of Ordnance Crucible Steel Co., Harrison, N. J.; U. S. Pipe & Foundry, Chattanooga, Tenn.; Jones & Laughlin Steel Co., McKeesport, Pa.; Petroleum Heat Power Co., Stamford, Conn.; Kaiser Industries, Denver; Batavia Metal Products Co., Batavia, Ill.; Struthers-Wells, Titusville, Pa.; War Supplies, Ltd., Sorel Industries, Sorel, Quebec; American Type Foundries, Elizabeth, N. J.; Kelly Springfield Tire Co., Cumberland, Md.; Oil Well Supply Co., Oil City, Pa.; National Steel Corp., Wierton Steel Co., Wierton, W. Va.; Harrisburg Steel Co., Harrisburg, Pa.; American Car & Foundry Co., Buffalo; National Tube Co., McKeesport, Pa.; Watertown Arsenal, Watertown, Mass.; E. G. Budd Mfg. Co., Philadelphia; McGraw Construction Co., Newport, Ky.; Rheem Mfg. Co., Williamsport, Pa.

Producers in Foreign Countries May Utilize CMP Procedure for Repairs

Washington

• • • **Persons who are** producing material in foreign countries on contract with or for sale to the United States Government may use CMP procedures to obtain maintenance, repair and operation supplies if they are specifically authorized to do so by WPB. Furthermore, such persons will be assigned a quota for their maintenance, repair and operating supplies purchases, beyond which they may not purchase.

Authorization to use the CMP Regulation 5 procedure may be obtained by addressing a letter in triplicate to WPB. The letter, however, should be filed with the FEA, Requirements and Supply Branch, which will recommend what action is to be taken in connection with the application. Based on this recommendation, WPB will grant or deny authority to applicants to use the MRO procedure.

At the same time, WPB said, exporters may buy up to specified amounts of controlled materials forms and shapes of copper, steel, and aluminum for export MRO purposes. Exporters may buy such material only if they know or have reason to believe that the material will be used for MRO purposes, excluding minor capital additions.

Limit on such purchases by exporters are: Carbon steel (including wrought iron), three tons; alloy steel, 1200 lb.; copper and copper base alloy, 300 lb.; aluminum, 500 lb.

Pittsburgh Steel Gets Price Relief

Pittsburgh

• • • **An increase in** prices charged by the Pittsburgh Steel Co., on carbon steel ingots, blooms, and billets, was granted by the OPA as a result of the company's petition on the ground that production costs were substantially above the maximum ceiling prices set by Revised Price Schedule No. 6. Furthermore, increases in the allocations of carbon steel have, in recent months, resulted in rather substantial losses on these commodities by the company.

Increases granted were: $2.10 per ton on ingots, $4.25 per ton on blooms, and $9.50 per ton on billets, with customary differentials for forging quality items. There has been no change in the price of alloy blooms, billets or ingots produced by the company.

Pittsburgh Steel had requested increases of $6 per ton on ingots, $10 per ton on blooms, and $14 per ton on billets.

The new price schedule for Pittsburgh Steel Co. on these commodities is as follows: Ingots — Rerolling grade, $33.10 per net ton. Forging quality, $38.10 per net ton. Blooms—Rerolling grade, $38.25 per net ton. Forging Quality, $44.25 per net ton. Billets—Rerolling grades, $43.50 per net ton. Forging Quality, $49.50 per net ton.

Inventory Regulation Is Simplified

Washington

• • • **OPA has announced** simplification and clarification of provisions of the regulations requiring the filing of inventory and sales reports for second-hand machines and parts, used industrial sewing machines, used pressure vessels, and used enclosed atmospheric pressure vessels.

Effective July 18, the changes in reporting requirements are as follows:

1—Exempted from filing reports. It is now specifically provided that Government agencies are not required to file inventory and sales reports.

2—Division made between inventory and sales reports.

(a) Inventory reports need not be filed by auctioneers, but they must be filed by every other person who sells any of the articles as an exclusive agent for the owner. A person is an exclusive agent for the owner when he is the only one whom the owner has authorized to sell the machine or part.

(b) Sales reports must be filed by every person who sells the articles—either as an agent, broker, or auctioneer, for the owner.

(Persons regularly engaged in the business of buying and selling second-hand machines and parts, used industrial sewing machines, used pressure vessels, and used enclosed atmospheric pressure vessels. must file both inventory and sales reports.)

3. Other changes. Reports must now be filed for any used part or subassembly of one of the listed machines or parts, where such a used part or subassembly has an "as is" maximum price in excess of $100 each.

Also, in the case of some of the listed machines or parts, inventory and sales reports need be filed only where the "as is" maximum price is in excess of that specified.

Report Issued on Canada's Output of War Vehicles

Ottawa

• • • **Canada has produced** war vehicles to a value of $2,000,000,000 with output reaching 650,000 units, C. D. Howe, minister of Munitions and Supply, announced. He said that production included 25,000 universal carriers, which rolled off the assembly lines at a rate of more than 725 per month during the past four months; 6000 armored vehicles such as scout reconnaissance cars, armored cars and snowmobiles; and 3500 tanks and self-propelled gun mounts. Nearly 150 gun mounts a month are being made.

In addition, said Mr. Howe, Canada is providing substantial quantities of railway equipment for the United Nations under the mutual aid agreement. Two thousand flat cars will be made for Russia, which already has received 40,000 tons of rails. An order for 145 locomotives for India has been completed, and a second contract calls for the delivery of many more of the same type. Other large India contracts call for 75,000 components such as axle boxes, buffers, draft casings and couplings.

Plant Operations at Capacity

Toronto

• • • **Dominion Steel & Coal** Corp. maintained plant operations at capacity at its Sydney, Nova Scotia, works for the first half of this year. Since the outbreak of war the company has spent upwards of $6,000,000 on plant expansion, of which $3,775,000 was expended in 1942, and $1,500,000 in 1943. However, the company's subsidiary plants in Nova Scotia, Montreal, Toronto and other points, have not kept pace with the main works.

Dominion Steel is now obtaining most of its iron ore supply from its own mine at Wabana, Nfld. The Wabana Mines are operating at about 50 per cent of capacity which is sufficient to provide the Sydney Steel Works. One of the new wartime developments is that Dominion Steel has been obtaining Brazil ore to sweeten the Newfoundland grade.

Previous to the war, the company obtained its high-grade ore from various sources overseas, including Sweden, Spain and the northern coast of Africa. Deliveries from Brazil, however, have superseded those from other countries, and when the company's steel mills are operating at peak it is necessary to import about 75,000 tons yearly of this high-grade ore.

Give Reduction Mill Contract

Hamilton, Ontario

• • • **Dominion Foundries** & Steel Ltd., Hamilton, Ontario, has given a contract at about $1,200,000 for installation of a cold reduction mill to operate in connection with the tin plate strip mill. It is reported that the expansion is being carried out to enable the company to increase the supply of sheet steel for war purposes.

METAL CANS*

Monthly Shipments by Manufacturers of All-Metal Cans, by Product to be Packed
January-May, 1944, Net Tons of Steel

Pack	January	February	March	April	May	Five Months, Total
Fruits and vegetables	34,801	40,279	45,270	47,602	54,226	222 178
Condensed and evaporated milk	15,667	17,662	25,860	29,573	36,771	125 533
Other dairy and poultry products	4 356	4,586	2,152	2,168	2,877	16 139
Meat	13,113	12,671	14,129	9,491	10 718	60 122
Fish and sea food	3 842	4 523	4 793	6,632	13,806	33 676
Military rations	6,492	6 048	5 499	4,887	5 700	28 626
Beer	22	0	814	2 224	4 278	7 338
All other foods	14 990	16 676	19 940	17 067	22 068	90 761
All non-foods	13,417	12,657	17,226	16,547	17,469	77 316
Total	106,700	115,112	135,683	136,211	167,913	661,619

* A metal can, as referred to here, is an unused container made wholly from tinplate, terneplate, blackplate or waste plate and is to be used for packing various types of products as shown in the table. Shipment data include cans shipped by "commercial" manufacturing plants to packers and cans produced and used by canners in "captive" plants for their own pack.

This series includes the data that have been compiled from the monthly reports of metal can manufacturers on Form WPB-2707. These reports are filed in terms of base boxes of steel consumed in the manufacture of metal cans.

The statistics are the tonnage equivalents of the base boxes of steel reported by the present industry of 90 companies comprising 193 manufacturing plants. The table shows the production of metal cans by months from the steel allotted under CMP Code 629 and Conservation Order M-81, and from the release of 116,700 tons of steel plate that had been frozen by Order M-81. Wire used in the production of keys and handles is not included in these tables. The production of these items consumed 961 tons of carbon steel in the first five months of this year.

Surveys Steel Packaged Products

New York

• • • More than 2500 products manufactured or processed by 135 industries are ordinarily packaged in steel containers, according to a survey released today by F. J. O'Brien, president of the Can Manufacturers Institute.

While heavy demands from the fighting forces have reduced the number of cans available to civilians, with some civilian products temporarily forced into subtitute containers, the overall number of kinds of cans in actual use today is greater than the peacetime total, it was stated. Cans for blood plasma, bomb fuses, rescue devices, emergency rations and hundreds of other strictly war uses not manufactured during peacetime swell the total considerably.

"The can manufacturing industry is still neck-deep in the war effort," Mr. O'Brien said. "Our primary job is to supply the fighting fronts and such civilian markets as steel allotments permit. The war situation has not cleared to the point that we can foresee any increase in tin cans for the consumer in the immediate future. However, we are hopeful that as stock-piles grow and the fulfillment of urgent demands for landing craft, steel landing mats, etc., leaves more steel available for other uses, more and more civilian products will be returned to market in their normal peacetime containers.

American Iron and Steel Institute — Capacity, Production and Shipments

STEEL PRODUCTS	Number of Companies	Items	Maximum Annual Capacity, Net Tons	MAY, 1944				TO DATE THIS YEAR			
				Production		Shipments (Net Tons)		Production		Shipments (Net Tons)	
				Net Tons	Per Cent of Capacity	Total	To Members of the Industry for Conversion into Further Finished Products	Net Tons	Per Cent of Capacity	Total	To Members of the Industry for Conversion into Further Finished Products
Ingots, blooms, billets, tube rounds, sheet and tin bars, etc.	46	1				707,931	241,065			3,541,383	1,109,556
Structural shapes, (heavy)	10	2	8,977,450	323,997	44.3	317,753		1,728,085	47.1	1,684,343	
Steel piling	4	3		6,651		9,497		29,718		28,734	
Plates (sheared and universal)	23	4	15,990,020	1,153,043	85.1	1,097,578	55,667	5,861,428	88.2	5,685,199	235,719
Skelp	6	5				72,931	55,599			361,169	281,319
Rails—Standard (over 60 lbs.)	4	6	3,625,000	205,916	67.0	204,379		984,031	65.3	974,329	
—All other	6	7	518,600	17,130	39.0	15,773		80,398	37.3	80,986	
Splice bars and tie plates	13	8	1,703,700	71,166	49.3	71,187		342,421	48.4	349,190	
Track spikes	10	9	373,200	13,052	41.3	13,265		62,021	40.0	65,780	
Hot Rolled Bars—Carbon	36	10		729,925		610,089	76,612	3,673,062		3,083,530	397,725
—Reinforcing—New billet	15	11		43,631		46,911		189,365		200,651	
—Rerolled	15	12		4,799		5,435		37,869		43,567	
—Alloy	22	13		265,289		193,052	43,546	1,363,432		993,752	194,511
TOTAL	45	14	21,207,210	1,043,544	53.1	855,487	120,158	5,263,728	59.7	4,321,500	592,236
Cold Finished Bars—Carbon	25	15		154,689		150,906		772,734		760,723	
—Alloy	22	16		33,446		28,757		175,629		154,301	
TOTAL	31	17	2,694,110	188,135	82.4	179,663		948,363	84.7	915,024	
Tool steel bars	18	18	214,970	12,316	67.6	11,756		61,134	68.5	57,817	
Pipes and Tubes—Butt weld	16	19	2,299,130	119,225	61.5	121,226		599,410	63.0	586,657	
—Lap weld	8	20	967,900	51,497	62.8	50,687		251,968	62.7	249,273	
—Electric weld	9	21	1,225,170	73,679	71.0	73,874		307,077	60.3	305,976	
—Seamless	15	22	2,659,250	201,113	89.2	202,599		938,163	89.4	978,243	
—Conduit	7	23	184,500	4,018	25.7	4,923		20,833	27.2	22,139	
—Mechanical tubing	11	24	1,004,450	69,080	80.0	67,783		348,570	83.5	356,228	
Wire rods	25	25	6,840,210	396,323	66.6	107,127	27,615	1,857,691	65.4	522,608	140,043
Wire—Drawn	40	26	5,468,830	306,055	66.0	179,490	4,626	1,498,920	66.0	847,258	21,197
—Nails and staples	18	27	1,224,880	55,958	53.9	53,390		293,567	57.7	284,417	
—Barbed and twisted	15	28	551,720	21,682	46.4	22,341		106,764	46.6	105,667	
—Woven wire fence	15	29	1,101,090	32,788	35.1	32,083		160,925	35.2	159,835	
—Bale ties	12	30	150,660	6,199	48.6	6,395		33,957	54.3	32,531	
Black Plate—Ordinary	9	31				46,692	216			193,016	832
—Chemically treated	8	32	464,000	12,865	32.7	12,959		70,941	36.8	67,281	
Tin and Terne Plate—Hot dipped	9	33	3,530,650	166,808	55.8	171,011		707,287	48.2	773,795	
—Electrolytic	10	34	1,962,500	67,445	40.6	60,010		268,209	32.9	246,791	
Sheets—Hot rolled	28	35	20,137,270	1,098,379	64.4	528,144	17,150	5,242,857	62.7	2,664,199	106,388
—Cold rolled	14	36	7,318,780	326,391	52.6	170,140		1,509,984	49.7	837,027	
—Galvanized	15	37	2,696,410	111,909	49.2	108,783		520,488	46.6	513,576	
Strip—Hot rolled	22	38	8,507,280	233,745	32.4	139,910	24,861	1,112,388	31.5	715,224	117,928
—Cold rolled	34	39	3,278,940	99,783	35.9	96,815		480,793	35.3	453,516	
Wheels (car, rolled steel)	5	40	348,800	24,579	83.2	24,022		123,290	85.1	123,092	
Axles	6	41	416,170	18,785	53.3	15,804		90,855	52.5	87,133	
All other	6	42	150,270	3,687	29.0	7,098		16,643	26.7	27,976	
TOTAL STEEL PRODUCTS	154	43				5,959,786	546,957			29,218,912	2,605,218
Effective steel finishing capacity	154	44	64,722,000								
Per cent of shipments to effective finishing capacity	154	45				96.9%				99.0%	

Price Policy Set for Disposal Of Government Used Machine Tools

Washington

• • • **Designed to put** them back into production as quickly as possible, William L. Clayton, surplus war property administrator, on July 14, announced a price policy for the disposal of Government used standard general purpose machine tools. A price policy for special types of tools will be announced later. The problem of disposal of surplus machine tools was declared to be a difficult one because of the engineering complexities and the large quantities that will be held by the Government when war production is cut back or completed.

The price formula for standard general purpose machine tools has two bases. When tools are not in the purchaser's plant, they are sold with an immediate depreciation of 15 per cent, less 2.5 per cent per month for the first six months, one per cent per month for the next four months and 0.8 per cent per month for the next 26 months as shown in the accompanying Table A. When tools are sold to a purchaser or lessee who has the tools in his own plant, the price is five points higher, as shown in the accompanying Table B, than the price applying to tools not in the purchaser's plant. The five point difference, Mr. Clayton said, arises from the fact that a purchaser of tools in his own plant not only has knowledge of their condition, but is under no necessity of paying freight charges. The depreciation runs up to a maximum of 45.2 per cent of the original price in the case of Table A used tools and to 50.2 per cent, the original price in the case of Table B tools bought after 36 months or more.

The depreciation price policy, it was explained, is based on the machine tool manufacturer's original price, inclusive of electric equipment and standard accessories, f.o.b. builder's plant. The price to the buyer is f.o.b. cars or trucks at storage location. Tooling was made available for purchase at the customer's option on the depreciated formula. The depreciation price was fixed from the date a machine was originally put into use, actual or estimated, to the date of termination of the lessee's facilities contract or to the time the machine tool is withdrawn from contract, placed in storage, or sold, whichever is earlier.

SWPA said that it is believed the adopted plan will facilitate prompt and orderly disposal of tools, with avoidance of expenses and losses arising from depreciation, obsolescence, warehousing and handling cost that would result from delayed disposal. It was also said that it is expected that the plan, with procedures that will be announced later, will prevent favoritism, speculation and other inequitable results that might flow from unsound distribution.

The following table gives prices on used standard general purpose machine tools, based on percentage of original prices:

	A*	B†		A*	B†
Before one month	85.0	90.0	19 Months	58.8	63.8
1 Month	82.5	87.5	20 Months	58.0	63.0
2 Months	80.0	85.0	21 Months	57.2	62.2
3 Months	77.5	82.5	22 Months	56.4	61.4
4 Months	75.0	80.0	23 Months	55.6	60.6
5 Months	72.5	77.5	24 Months	54.8	59.8
6 Months	70.0	75.0	25 Months	54.0	59.0
7 Months	69.0	74.0	26 Months	53.2	58.2
8 Months	68.0	73.0	27 Months	52.4	57.4
9 Months	67.0	72.0	28 Months	51.6	56.6
10 Months	66.0	71.0	29 Months	50.8	55.8
11 Months	65.2	70.2	30 Months	50.0	55.0
12 Months	64.4	69.4	31 Months	49.2	54.2
13 Months	63.6	68.6	32 Months	48.4	53.4
14 Months	62.8	67.8	33 Months	47.6	52.6
15 Months	62.0	67.0	34 Months	46.8	51.8
16 Months	61.2	66.2	35 Months	46.0	51.0
17 Months	60.4	65.4	36 Months (or more)	45.2	50.2
18 Months	59.6	64.6			

*Machine tools not in purchaser's plant.
†Machine tools in purchaser's plant.

MIDGET: *At Seattle, a midget 3-wheel tractor hauls material into the Boeing Aircraft plant. Motorized equipment at the plant is credited with slashing the man hours necessary to build a plane since the outbreak of war.*

Backlogs to End of Year

Cincinnati

• • • **The district** machine tool market shows relatively no change during the present week. While ordering has eased definitely from the previous brisk rate of a month ago, manufacturers indicate a satisfactory flow of new business on a peace time standard. Plants generally are backlogged for the remainder of this year, with several manufacturers of heavy tools indicating assured high rate of production well into next year. While the problem of obtaining material has still some difficulties, manufacturers indicate that the tenseness of the situation is not as great as it was about a year ago during the heavy flurry for all types of machine tools. The manpower situation, however, continues to be a bugbear with little or no hope for a good solution, since the armed forces are taking substantial drafts of men, particularly in the younger classes. The need for skilled men, of course, continues to be outstanding.

Micromatic Hone Stock Issue

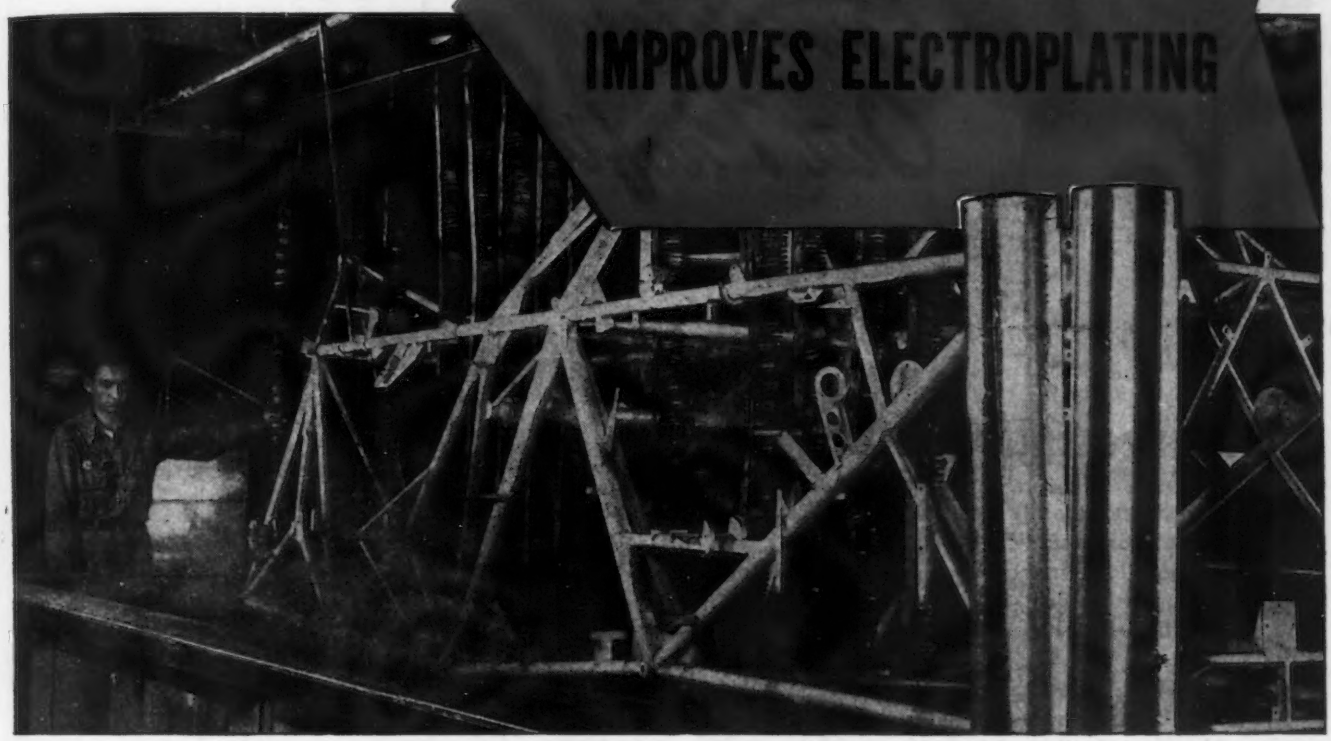
Philadelphia

• • • **Micromatic Hone Corp.,** Detroit, has filed a registration statement with the Securities & Exchange Commission covering the issuance and sale of 75,000 shares of its 5 per cent convertible preferred stock, par value $10 per share, the proceeds of which will be used for general corporate purposes. Public offering price is to be announced later.

Prosolv *B*

offers outstanding advantages

NEW TURCO CLEANER IMPROVES ELECTROPLATING



Equally effective in still tank and electro-cleaning

So positive are the advantages of Turco Prosolv *B* that prominent electroplaters have switched to this new cleaner immediately following tests *although they had considered satisfactory the materials they had been using.*

Turco Prosolv *B* insures the chemical and physical cleanliness that is essential to 100% bonding to steel of zinc, cadmium, chromium and other plate. It removes every trace of oil, grease, smut, paint and rust preventive compound. It contains no soap; leaves no deposit. Rinsing is complete, even though parts may have dried.

A highly concentrated product, Turco Prosolv *B* is 100% active. Every particle works; there is no waste.

As this new cleaner is effective in both still tank and electro cleaning, it simplifies stocking and plant procedure where both processes are employed.

Try Turco Prosolv *B* for stripping tin deposits formed during certain electro-pickling processes. A standard cleaning tank may be used for this.

Call the Turco Field Service Man for details on this specially formulated electro and still tank cleaning material which is doing such a notable job the nation over. Write today.

Follow Prosolv *B* with Turco Descaler This second step in preparing steel for plating is as necessary to a perfect job as the primary cleaning operation in Prosolv *B*. Any rust, mill, welding or heat-treat scale will prevent bonding of plate. Turco Descaler removes these without attacking the base metal. Thus the combination of Turco Prosolv *B* and Descaler insures quality plating at low cost. Let us furnish full details.

Rust Bar treatment for unplated portions. Partially plated parts, if treated with Turco Rust Bar, are well protected from corrosion during indoor storage although subjected to severe conditions. A thin film of Rust Bar is resistant not only to airborne water vapor, but also to corrosive gases and other types of corrosive agents.

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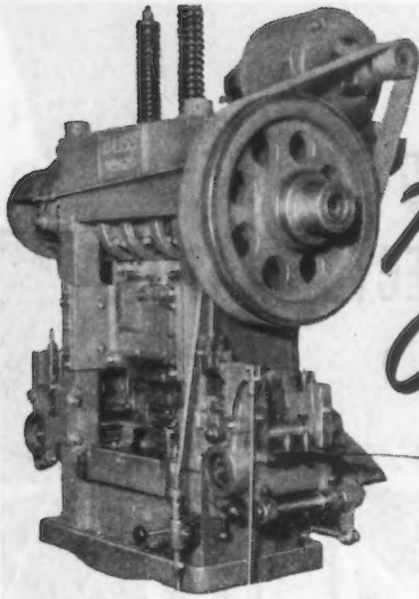

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TROUBLE-FREE ON THE PRESSES!... That's the prescription for profits that's matched to a "T" by Roebling Flat Wire and Strip Steel for punching, shearing or drawing. You get smooth . . . speedy production. Fewer machine jams . . . fewer rejects . . . because Roebling Flat Wire is dimensionally stable—with temper and finish uniformly controlled and steel analysis specifications jibed with the job.

If your production schedules demand flat, round, shaped wires or strip steel of exacting specifications—rely on Roebling. Making steel like this is a specialty with us. And we have the facilities and man-power to turn out the wire now—that will turn out the production for you.

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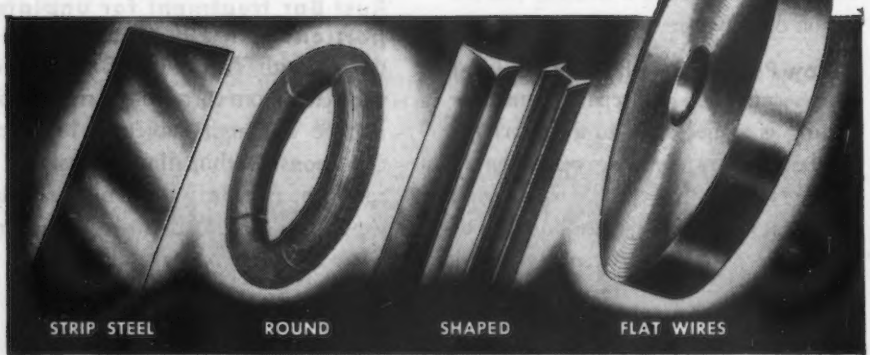

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War Department Shows Surplus War Equipment

Washington

• • • An exhibit of surplus war equipment was shown to the press at the Pentagon Building recently under the auspices of the Army Service Forces, Readjustment Division. Various types of industrial and consumer goods were put on view to acquaint industry, the public and contracting officers with the types of material which is being currently declared surplus and in addition to indicate what prices the public may expect to pay.

For instance, there was a case filled with special purpose gages that cost $8,000 new, but are now being offered by the War Department at a few cents a pound. In the same category, were special tools, dies, jigs and fixtures originally made for making military items which the Army no longer needs, and for which there is little or no civilian use.

Complicated fire control apparatus which was replaced soon after this country went to war by more modern equipment is being scrapped in its entirety.

PAGE RUBE GOLDBERG: *This curious contraption is used by MP's in teaching correct finger squeeze at Fort Custer, Mich. If the soldier pulls instead of sqeezing, the trigger releases a skate-wheel, tripping a hammer. This pulls a wheel which drops a weight into a box, releasing a spring, causing the paddle at right to make solid contact with the seat of the soldier's pants.*

INDUSTRY'S NEW SOURCE OF CONTROLLED POWER

IT'S

Fluid Power

THAT OPERATES

A TRAIN

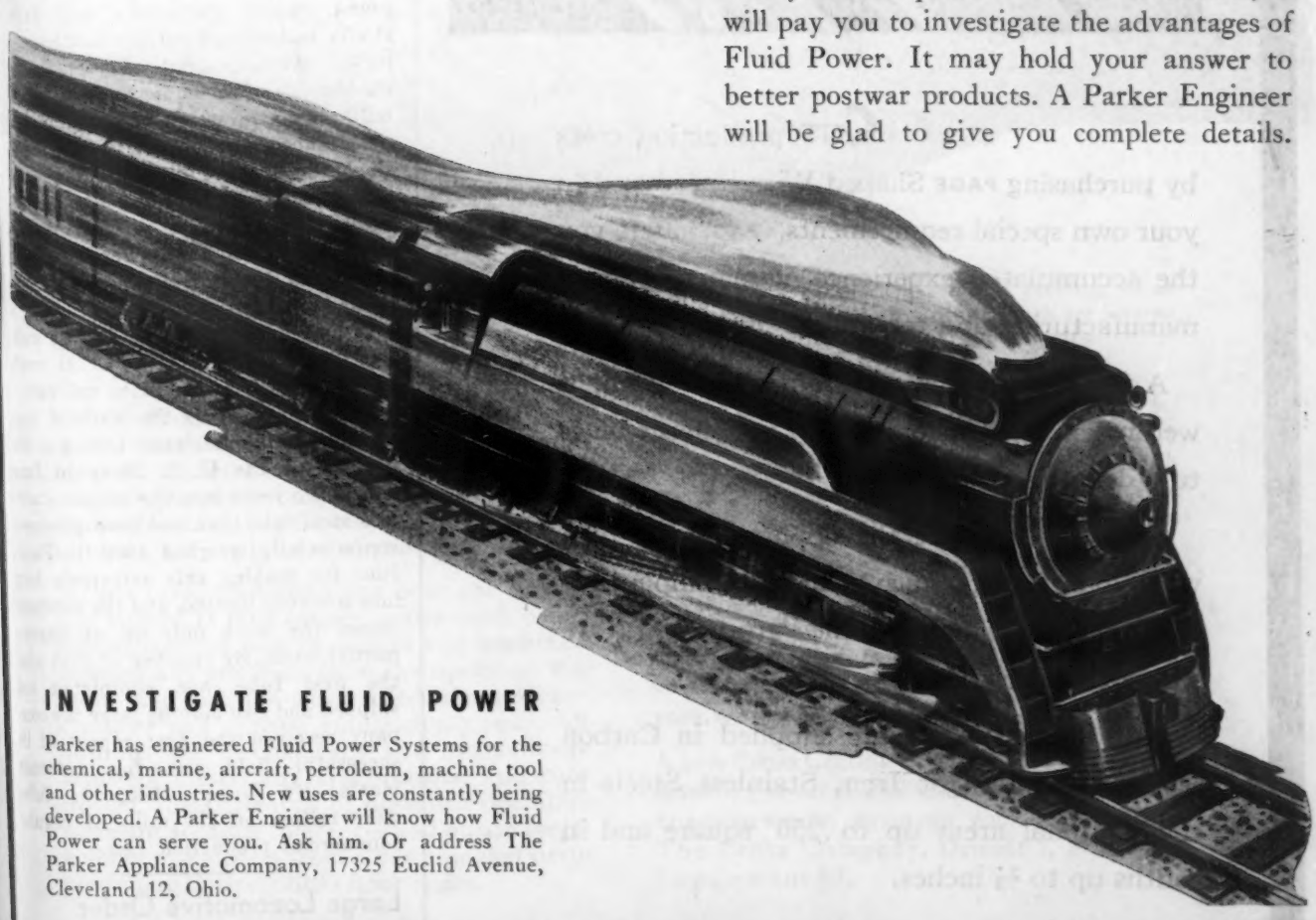
On railroads Fluid Power is used for everything from blowing the whistle to stopping the train. And it is only with Fluid Power that all brakes can be controlled from the cab.

Fluid Power is transmitted through tubes. Brake pressure is delivered to every car without shafts, gears, belts or pulleys.

This method of providing force where it is needed has many advantages. With Fluid Power you can move tons or squash a bug on a watch crystal!

Fluid Power is easy to control. Parker Engineered Systems are performing a host of different tasks in a wide variety of industries. Applications of Fluid Power seem almost limitless.

If you need power for drive or control, it will pay you to investigate the advantages of Fluid Power. It may hold your answer to better postwar products. A Parker Engineer will be glad to give you complete details.



INVESTIGATE FLUID POWER

Parker has engineered Fluid Power Systems for the chemical, marine, aircraft, petroleum, machine tool and other industries. New uses are constantly being developed. A Parker Engineer will know how Fluid Power can serve you. Ask him. Or address The Parker Appliance Company, 17325 Euclid Avenue, Cleveland 12, Ohio.

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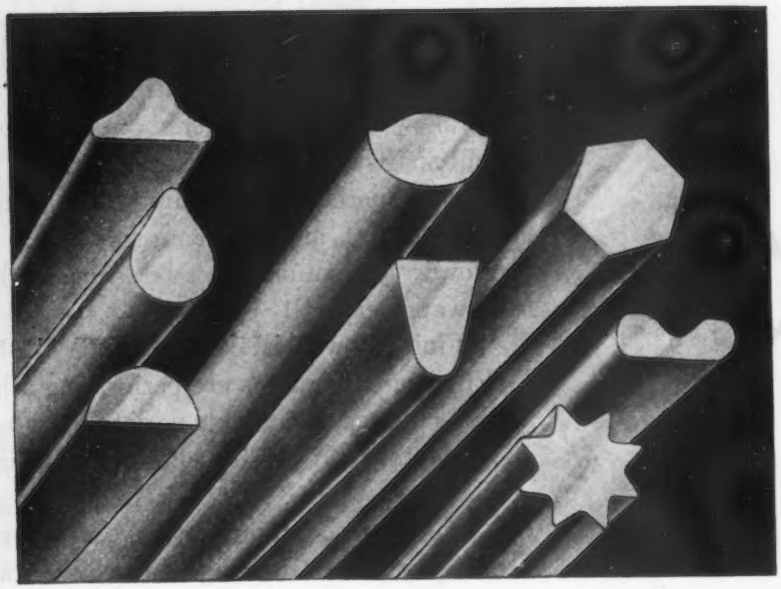
CLEVELAND **PARKER** LOS ANGELES

APPLIANCE COMPANY

FLUID POWER ENGINEERING

PAGE *Shaped* WIRE



CUT production costs by purchasing PAGE Shaped Wire—produced to your own special requirements. PAGE offers you the accumulated experience of many years of manufacturing and research facilities.

A discussion of your program with PAGE might well mean the development of your basic ideas to a definite saving in your product.

PAGE will welcome the opportunity to plan with you. Get in touch with us in ample time so that, when we all get the "green light," we will both be ready.

PAGE Shaped Wires are supplied in Carbon Steels, Armco Ingot Iron, Stainless Steels in end sectional areas up to .250″ square and in widths up to 3/8 inches.

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BRIDGEPORT • CONNECTICUT

New Industrial Process Cuts Production Time On Alloy Steel Tubes

Beaver Falls, Pa.

• • • **Because the time** for making a strong corrosion-resistant, stainless alloy steel tubing has been cut by a new industrial process, the production of submarines has been facilitated according to Peter D. White, vice president and general manager of the Babcock & Wilcox Tube Co., here.

Mr. White declared that the company's method of making the 40-ft. seamless high alloy tubing in its specialty tube plant had cut production time to about 15 per cent of the time needed to produce the tube by forging methods, the standard technique of making such tubes until a year ago. The tubing is used for antennae masts.

Previously, the production of antennae masts, periscopes and drive shafts had caused serious bottlenecks in the overall output of submarines. By the use of a simple and ingenious mill operation in the tube manufacture, Babcock & Wilcox was able to slash the time required to make antennae masts, despite the obvious difficulties in producing a tube of this size and exacting requirements. The unfinished tube from which the antennae masts are made is 40 ft. long x 6 in. in diameter with a 0.600 in. wall, and weighs over 1450 lb. It costs $1,500, under O.P.A. price ceilings.

B & W undertook the work of supplying the antennae mast tubing at the request of the U. S. Navy in June 1942. Two years ago, the largest stainless steel tube that had been produced commercially weighed 1000 lb. Facilities for making this extremely long tube are very limited, and the company began the work only on an experimental basis. By October of that year the first tube was completed and shipped and two months later the company received the first report of its successful field use for antennae masts. By spring, 1943, the tubes were rolling off the mills at regular commercial production rates.

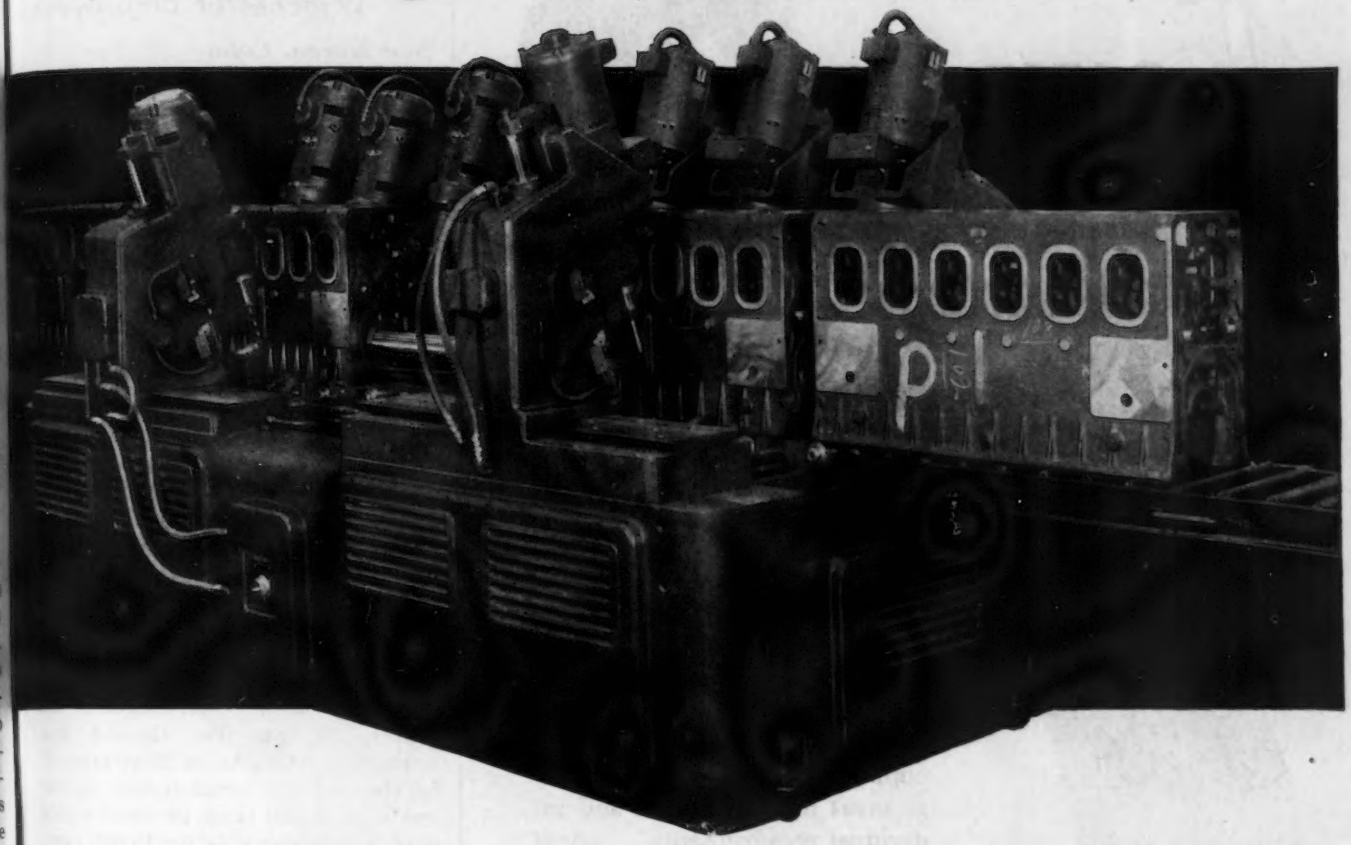
Large Locomotive Order

Kingston, Ontario

• • • **The Canadian Locomotive Co.,** here, has received an order for 75 locomotives for export, William Casey, president, reported. At the beginning of March the company had orders on hand for 100 locomotives and it is stated that further export orders are pending.

PLUS

45 PIECES PER HOUR DRILLED AND TAPPED



● **AUTOMATIC**—Yes, because the cylinder blocks are transferred from station to station, and drilled and tapped without operator attention.

● **PLUS**—because, in addition, feeding, locating, clamping and ejection of the work are accomplished automatically at the push of a button.

CROSS ENGINEERS designed and built this *special machine* to drill and tap five angular holes in a Diesel engine cylinder block. The results typify the principle behind every Cross *Special Machine*—high-speed, automatic removal of metal on equipment anyone can operate.

In this case, 45 blocks per hour are drilled and tapped at 80% efficiency, the work being moved from station to station and machined without any attention from the operator. But more than that, the work is fed, clamped, unclamped and ejected automatically, too. All motions are mechanically and hydraulically actuated, electrically synchronized and controlled. Inexperienced or unskilled operators maintain accurate tolerances and obtain large-volume production from a machine that occupies comparatively little floor space.

Thus Cross engineering produces a *special machine* to combine difficult drilling and tapping operations and perform them at high speed at the push of a button—a principle Cross can apply to your many metal-removing problems.

Cross Engineers are prepared to help lower your costs and assist with your manpower difficulties by designing, building and installing special machinery in your factory and showing your workmen how to operate it.

A new Cross Catalog contains 35 detailed case histories of successful Cross *Special Machines*. For your copy, write on your letterhead to The Cross Company, Detroit 7, Michigan, Department 52.

Special Machines ●

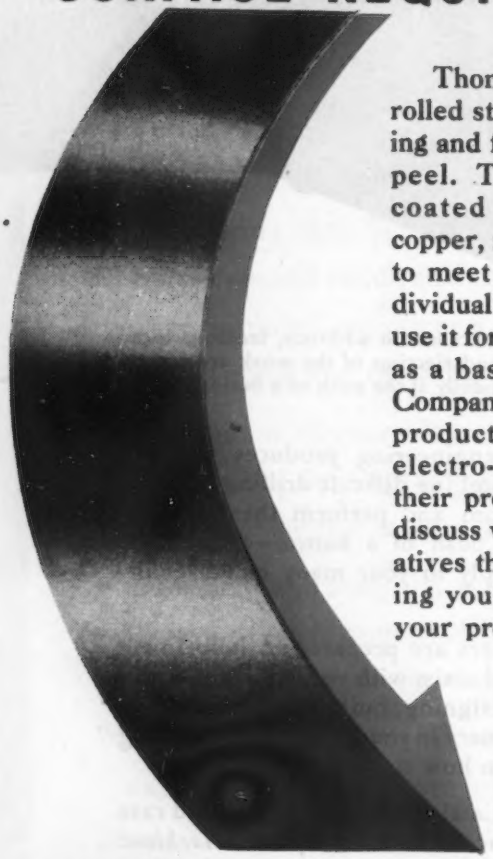
S-11

for automatically performing any one or a combination of metal cutting operations

TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

COATED FINISHES

FOR MANY SURFACE REQUIREMENTS



Thomas electro-coated cold rolled strip steel for deep drawing and forming will not chip or peel. Thus, Thomastrip precoated with nickel, brass, copper, zinc, and solder is used to meet many different and individual requirements . . . some use it for a final finish and others as a base for further plating. Companies have shortened their production lines by adapting electro-coated Thomastrip to their products. Why don't you discuss with Thomas representatives the possibilities of reducing your costs and increasing your production?

BRIGHT FINISH NOT COATED, SOLDER COATED, ELECTRO-COATED WITH NICKEL, ZINC, COPPER, BRASS, AND LACQUER COATED—IN COLORS

Thomas Strip
COLD ROLLED STRIP STEEL

THE THOMAS STEEL CO. • WARREN, OHIO
SPECIALIZED PRODUCERS OF COLD ROLLED STRIP STEEL

19 National Awards To Winchester Employees

New Haven, Conn.

• • • **Nineteen national awards,** the highest number ever accorded a single war plant at one time, were awarded recently to employees of Winchester, for ideas, suggestions, and inventions which speed the flow of weapons and supplies to the fighting forces, it was announced by the War Production Board.

These awards, plus other previous awards in WPB's production drive, represent a saving of 430,000 valuable man-hours by Winchester workers' suggestions, it was said by Thomas I. S. Boak, works manager.

"For purpose of illustration," Mr. Boak said, "this huge man-hour savings from employees' ideas, would be equal to the manufacture of 37,000 Winchester carbines or 24,000 Garand rifles to speed to our fighting forces."

Using cartridges for an example, Mr. Boak said the saving would represent 30,000,000 more cartridges of the caliber .30 type for Garand and Springfield rifles. As an illustration of backing up our aerial forces, skilled and semi-skilled labor involved would have been responsible for 15,000 cartridge core radiators used on the deadly P-38 Lightning fighter planes, he said.

He added that another striking result of the employees' suggestions was the saving of 727,000 lb. of highly critical brass which did not have to be reworked, and from which 35,400,000 Winchester carbine caliber .30 cartridges or 13,700,000 caliber .30 cartridges for Garand or Springfield rifles could be manufactured.

FLAK HELMET: *Sergt. Bob Kennedy, Lake Placid, N. Y., wears the newest type flak helmet, designed to provide additional protection to the head and neck of aerial gunners. The form fitting helmet is constructed of many small metal squares and lined with sponge rubber.*

All the facilities of the N. A. Woodworth Company are devoted to one purpose . . . The manufacture of precision tools and gages with the longest accurate life . . . To give users the lowest possible operating costs.

Reduce your production expense with sustained accuracy by Woodworth. Wire for stock list today.

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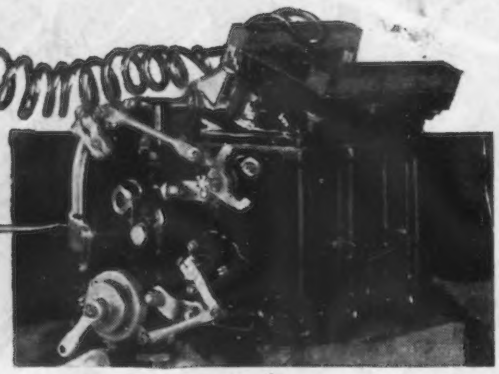
"Always in the Groove"

with "Snap-on" Screw Drivers

made of

KEYSTONE

Wire

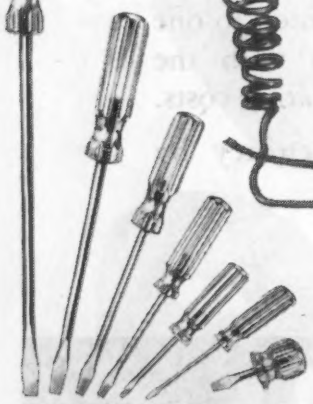


This complicated apparatus looks like a typewriter, but actually is an airplane carburetor . . . snapped while being adjusted by a master mechanic of Trans-Canada Airlines, using his regular *Snap-on** screw driver. You'll find *Snap-on* tools being used wherever precision adjustments and heavy-duty tool service are required.

The blades of *Snap-on* screw drivers are made of special Keystone wire. Keystone's skill in producing industrial wire is one reason why *Snap-ons* are able to "stand the gaff".

We are proud that this leading company chooses Keystone wire for its outstanding products.

*Snap-on Tools Corp. Kenosha, Wis.



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STEEL & WIRE CO., Peoria 7, Illinois

Special Analysis Wire for All Industrial Uses

SAMSON SPRING WIRE

Coppered, Tinned, Annealed, Galvanized

Rivet Group Plans Simplified Program

Washington

• • • **Plans for the** creation of a voluntary standardization and simplification program for the industry were discussed by members of the newly-organized Rivet Industry Advisory Committee at their first meeting recently in Washington.

WPB said that the industry expects a saving in manpower and material and a reduction in stocks and tools will result from the standardization of some sizes and designs of rivets. Reports on the carbon steel, copper and aluminum situation were made by Government representatives. The group reported that shortage of manpower was the industry's greatest production problem at present. Government officials informed them that the new WMC recruitment plant might afford some relief.

The industry does not have a large surplus stock accumulation, committee members said. Up to the present time, the industry has been able to absorb into its own stock most of the surplus from contract terminations.

England Offers to Ship 10,000 Tons of Steel Plate

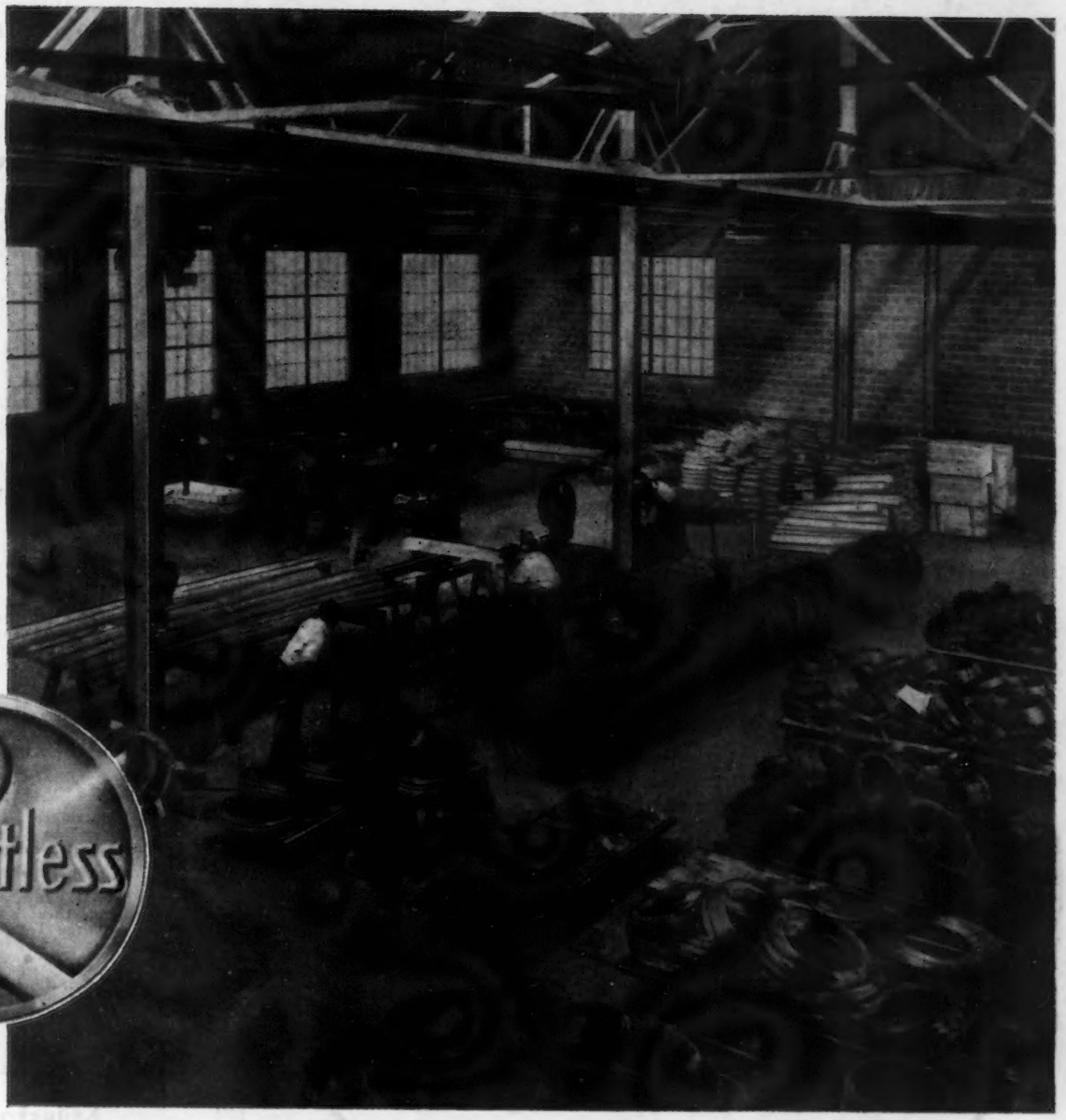
Washington

• • • **William L. Batt,** chairman of the Combined Raw Materials and Related Boards at a press conference July 7 said that England recently volunteered to ship 10,000 tons of steel plates monthly to the United States under a reverse lend-lease arrangement. This new development reflected the tight situation in plates because of growing demands of the Navy and Maritime Commission. Even more important it was taken to indicate that allied nations are in a more comfortable position regarding steel supplies and that shipments of certain types of steel abroad have been either greatly curtailed or stopped.

Announce June Plate Output

Washington

• • • **Dropping about 69,000** tons below the goal of 1,180,000 tons, WPB has announced that June plate production was 1,111,561 tons. This compares with an output of 1,132,211 tons in May. The record monthly production was in March when plate production was 1,222,606 tons.



Quicker Deliveries of Stainless Steel Can Now Be Made

Rustless concentrates on Stainless Steel billets, bars and wire. Deliveries of mill items — both large and small quantities — are better than they have been for almost four years.

A large stock permits immediate shipment of many items.

May we quote on your requirements?

RUSTLESS

Producing STAINLESS STEEL *Exclusively*

RUSTLESS IRON AND STEEL CORPORATION BALTIMORE 13, MD.

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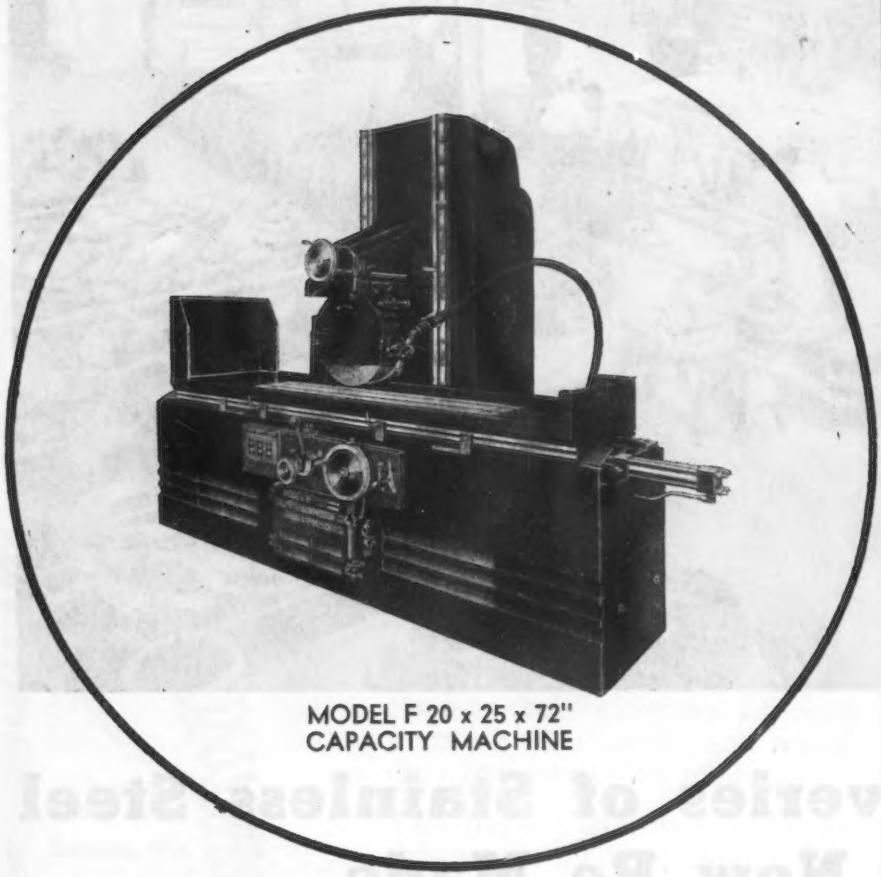
GRAND RAPIDS

PRODUCTION TYPE HYDRAULIC FEED SURFACE GRINDERS

are meeting the most exacting needs of Army, Navy and Air Corps contractors requiring maximum production in surface grinding.



MODEL F 20 x 25 x 72" CAPACITY MACHINE

THE MACHINES ARE BUILT IN TWO TYPES:

MODEL "F" in sizes from 16 x 25 x 48" to 20 x 25 x 72", with maximum table speed of 150 F.P.M.

MODEL "A" in sizes from 12 x 18 x 36" to 14 x 18 x 72" with maximum table speed of 125 F.P.M.

Send for Bulletin 443

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Among the Week's Trade Notes

Caterpillar Tractor Co., Peoria, Ill., announces that Dramer-Church Tractor Co., Ltd., will represent the company in the Saskatchewan, Canada, territory with headquarters in Regina.

•

Reliance Steel Corp., Cleveland, and Detroit Steel Corp., Detroit, announce the merger of the two companies under the corporate name of Detroit Steel Corp. There is no change in policy or personnel.

•

American Chain & Cable Co., Inc., Bridgeport, Conn., has acquired the Pennsylvania Lawn Mower Works, Inc., Primos, Pa.

•

Admiral Corp., Chicago, has appointed the Luthe Hardware Co., Des Moines, Iowa, as distributor for the central section of the state.

•

Western Ornamental Iron, Inc., Tacoma, Wash., has changed its name to Washington Steel & Welding Co.

•

Eastern Machine Screw Corp., New Haven, Conn., announces the appointment of F. F. Barber Machinery Co. as Canadian representatives with offices in Toronto, Windsor, and Montreal.

•

McCulloch Engineering Co., Milwaukee subsidiary of Borg-Warner, has been changed to B-W Superchargers, Inc., by the board of directors at McCulloch.

•

Edward Katzinger Co., Chicago, has changed its name to Ekco Products Co. Policy and personnel remain unchanged.

•

Tivit Products, Inc., has purchased the Torrance Steam Cleaner Co. and moved its main offices to the Torrance factory at Torrance, Cal.

•

Acme Steel Co., Chicago, has licensed the Thomas Steel Co., Warren, Ohio, to produce flexible steel slat stock for venetian blinds under Acme patents.

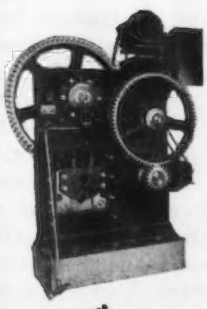
Milestones

• • • **The Trundle Engineering Co.**, Cleveland management engineering firm, celebrated its 25th anniversary with a two-day meeting of its entire staff, July 1 and 2.

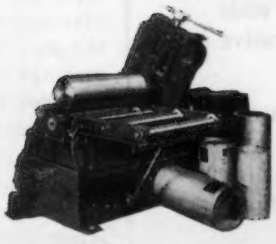
George T. Trundle, Jr., founded the company in 1919. Starting with a personnel of only three people, the organization today has 151 employees, 135 of whom are engineers. Branch sales offices were opened in Chicago in 1939 and in New York in 1940. The company, one of the largest in its field, acts as consultant upon practically any phase of management problems.

Employees of the company presented Mr. Trundle with a plaque which reads: "In this company, as in any other, progress is a measure of management. In recognition of what you have accomplished in the 25 years since you founded this business, your organization presents to you this evidence of its deep appreciation."

TIMKEN AXLE NEWS
VOL. 13 1944 No. 3
PUBLISHED BY THE TIMKEN-DETROIT AXLE CO., DETROIT, MICHIGAN
TIMKEN SAYS:
"We have a big job to do and our Buffalo Billet Shear is doing it—cutting off steel billets 10 inches in diameter at the rate of 6 a minute! The Timken production program welcomes this efficient expediter!"
THE "Buffalo" LINE INCLUDES
Universal Iron Worker
Bending Rolls—Billet Shears
Horizontal Benders
GUILLOTINE?
No, not exactly, but if your neck was of steel 10-inches thick, this monster could take off your head just as quickly as the guillotine lopped off the heads of kings (and queens) in days of old. It is a mammoth billet shear, recently installed in Timken Axle's Melvindale Forge Plant, used to cut steel bars into short lengths called billets. Here are some interesting facts—total weight, 165,000 lbs.; flywheel, 80" diameter, 12½" face, weight 6 ton; main gear, 135" diameter, 15" face, weight 10 ton; crank diameter 27½" at eccentric, 19½" at bearing; frame 4½" thick armor plate, welded. Speed, 6 strokes per minute. Pressure between knives, 4,500,000 lbs.; cutting capacity, 9" round corner square or 10" round, 65,000 lb. tensile stock

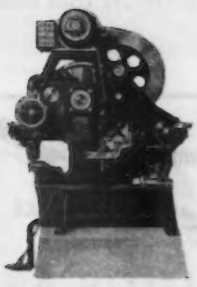


"Buffalo" BAR CUTTER



"Buffalo" WRAPPING ROLL

"Buffalo" HORIZONTAL BENDING ROLL



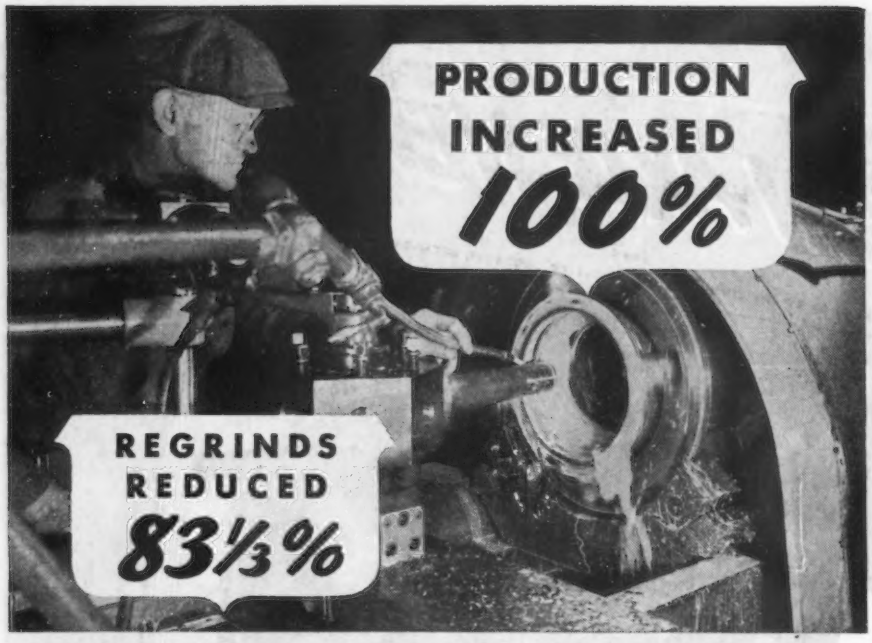
"Buffalo" UNIVERSAL IRON WORKER

ARMY NAVY

BUFFALO FORGE COMPANY

492 BROADWAY BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



"HARDSTEEL" TOOL BITS

Outperformed all other tools on this difficult machining job

Many plants have reported the outstanding performance of "HARDSTEEL" tool bits—the following is typical.

Production of aerial torpedo tail cones from SAE 3150 steel forgings bored on a 96-inch lathe running at 126 ft. per minute and taking a .250 in. cut at .012 in. per rev. feed was three a day. Seven cuts were required,—with 3 regrinds per piece, using a high grade tool.

After changing to "HARDSTEEL" tool bits the feed was doubled to .025 in. per rev.—regrinds were cut to 3 per day and output increased to six tail cones per day.

"HARDSTEEL" tool bits are cast from a special alloy, the same material that enables "HARDSTEEL" drills to drill hardened steels without annealing. They are economical on tough, hard steels, scale covered forgings and the tough, abrasive copper and light metal alloys.

Let "HARDSTEEL" help you turn out more work at lower cost. Outline your tool problems—or ask for a copy of the "HARDSTEEL" Operators Manual.

Drill steels hardened by any method without annealing. You harden it—we'll drill it.

BLACK DRILL COMPANY
Division of
BLACK INDUSTRIES
1400 East 222nd Street • Cleveland 17, Ohio

"HARDSTEEL"
DRILLS · TOOL BITS · SPECIAL TOOLS

Electroplaters Discuss Finishing Methods

(CONTINUED FROM PAGE 69)

to discard the solution periodically, maintenance requirements are also unusually low.

During the past two years, many corrosion tests of different kinds have been conducted. The following weighted values were obtained on 0.00025 in. zinc on steel, using the standard salt spray with 20 per cent salt solution at 95 deg. F. (Government specification AN-QQ-S-91).

(1) *To First White Corrosion Products:*

Zinc	1 to 2 hr.
Black Anozinc (unsealed)	75 to 125 hr.
Black Anozinc (sealed)	100 to 150 hr.
Yellow Anozinc	150 to 200 hr.
Transparent Anozinc	130 to 180 hr.

(2) *To Rusting of Base Metal:*

Zinc	200 hr.
Black Anozinc (unsealed)	650 hr.
Black Anozinc (sealed)	1000 hr.
Yellow Anozinc	650 hr.

With 0.0005 in. zinc, additional general improvement was obtained but with the same general direction as shown above. Roughly, the figures to rusting were about double, the formation of white corrosion products being practically independent of the thickness of the zinc.

After more than one year's exposure no appreciable attack has been reported as yet on Anozinc over a thickness of deposit of 0.0002 in. zinc plated on steel, whereas control samples of plain electroplated zinc have shown severe corrosion and rusting in many cases. Tests in the humidity cabinet have been conducted on Anozinc, using 100 per cent humidity at 100 deg. to 120 deg. F. In general, results show that either yellow or black coatings will give complete protection against white corrosion for well over a thousand hours in this test. Organic coatings in combination with Anozinc give protection of well over 1000 hr. in the salt spray. Adherence of such coatings to an Anozinc base is far superior to that of untreated zinc.

Of particular commercial interest is the relatively good corrosion resistance of the Anozinc coatings after being heated under conditions, simulating holds of ships, deserts, tropics, special bakes, etc. as compared to dip coatings in general. In every case the Anodic coatings stood up several times as long in subsequent salt spray tests to white corrosion products.

Anozinc coatings are suitable for work which has to meet Government specifications pertaining to zinc plating, such as 57-0-2C and AN-P-32, Rev. 2. (*Continued on page* 130)

X-Ray on wheels

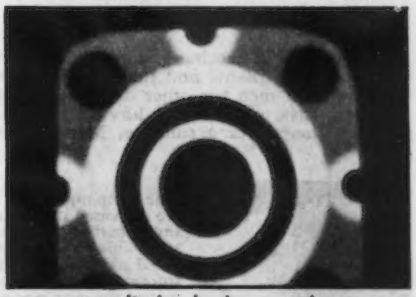
this powerful Mobile 150 KVP X-Ray Unit brings non-destructive x-ray inspection to any part of your plant.

"ON THE SPOT" RADIOGRAPHY The Picker 150 KV Mobile Unit brings comprehensive facilities for X-Ray inspection directly to any point of production in your plant.

This compact, powerful, easily transportable apparatus fulfills every requirement for production inspection or spot checking of many diverse materials . . . metals, plastics, fabric, wood. Completely self-contained, requiring only a current source, the Picker 150 KV Mobile Unit provides positively controlled voltages from 15 KV to 150 KVP, with a radiographic capacity (with screens) up to 1½" of steel and 7" of aluminum. The rapidity of exposures ideally adapts this Unit to consecutive production inspection.

Write today for our bulletin on the Picker 150 KV apparatus, which gives details of construction, capacities and applications. Our engineering staff and research bureau is at your service for the study of any special problems concerning non-destructive radiographic examination.

Some typical examples of defects disclosed by non-destructive radiography



porosity in aluminum casting

micro-porosity in aluminum casting

gas inclusion in steel

PICKER 150 KV
MOBILE X-RAY UNIT
Capacity 10 milliamperes at 150 KV continuous

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ITE MANUFACTURING DIVISION
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PICKER X-RAY OF CANADA, LTD.
MONTREAL • TORONTO

First "E" Award in the X-Ray Industry

IS YOUR PROBLEM ONE OF MAINTAINING PRODUCTION WITH LESS *Manpower?*

Proper use of mechanized material handling equipment can help offset manpower losses. Most plants find that a Baker Truck—with a single operator, will release a number of men for other duties. Faster handling of materials speeds production in other ways, too. If you have a manpower problem, the actual case histories below may offer a solution. Many more are reported in the New Baker Catalog.

★ ★ ★ ★ ★

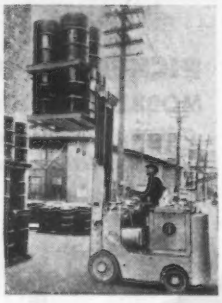
One company writes "With our Baker Truck we increased storage area by stacking, releasing valuable space for production . . . We were able to save the labor of six men and speed movement from receiving platform to storage—saving elevator tie-up . . . we removed the ever-present danger of strains and hernias." (See illustration at left.)

Records show that one of the first ram trucks, introduced by Baker in 1922, realized savings of 35 man hours per carloading for a steel mill. Today ram trucks are standard equipment for handling coiled materials. Illustration at right shows one of a fleet of Baker Trucks in the world's largest, most modern stainless mill.

"Womanpower" has replaced lost manpower and helped maintain production in thousands of plants. Because of their extreme ease of handling, Baker Trucks are ideal for women operators. Illustration at left shows a truck in service at a plant of the world's largest aluminum producer.

A fleet of eight Baker Trucks keeps the plant of a large domestic range manufacturer—now engaged in turning out war goods—at top production. Trucks service machines with materials to keep them running without interruption. Faster movement of parts and products in plant, warehouse and on loading platforms has cut handling costs 75%. (See illustration at right.)

An important factor in maintaining production in a large aircraft plant is the minimizing of "down-time" of large presses. The Baker Die Handling Hy-Lift Truck makes quick work of removing or placing dies in position—and simplifies their storage. (See illustration at left.) This plant also uses Baker Crane Trucks for speeding operations on the assembly line.



The problem of handling efficiently the wide variety of materials at a large chemical manufacturing plant is solved by a fleet of Baker Fork Trucks. (See illustration at right.) In carloading operations alone, on a conservative estimate, one Baker Truck replaces seven men with hand trucks.

WRITE FOR YOUR COPY

Plant and production managers, traffic managers, superintendents, purchasing agents and any others concerned with material handling will find the new Baker Catalog No. 52 a valuable reference.

BAKER INDUSTRIAL TRUCK DIVISION *of The Baker-Raulang Company*

2175 WEST 25th STREET • CLEVELAND, OHIO

In Canada: Railway and Power Engineering Corporation, Ltd

Baker INDUSTRIAL TRUCKS

FEATURE CONTINUATIONS

The main disadvantage of Anozinc is that the process is not readily applicable to bulk work. However, for production operation of racked articles, Anozinc has many advantages and is recommended where quality of coating, low costs, simple equipment and ease of control are important.

The author discussed the theory of chromate coatings on zinc and the chemical and electrochemical reactions, comparing dip coatings with anodic.

It is thought that the chemical dip coatings form by a rhythmic banding principle. That is, the zinc ion must diffuse a finite distance from the base metal before an insoluble band is formed, in a manner similar to the formation of the well-known copper chromate bands in silica gels.

In contrast, Anozinc coatings are not diffusion coatings and form entirely electrochemically. Therefore, they become an integral part of the base metal, just as electrodeposited metals also become an integral part of the base metal and adhere much more firmly than do immersion deposits.

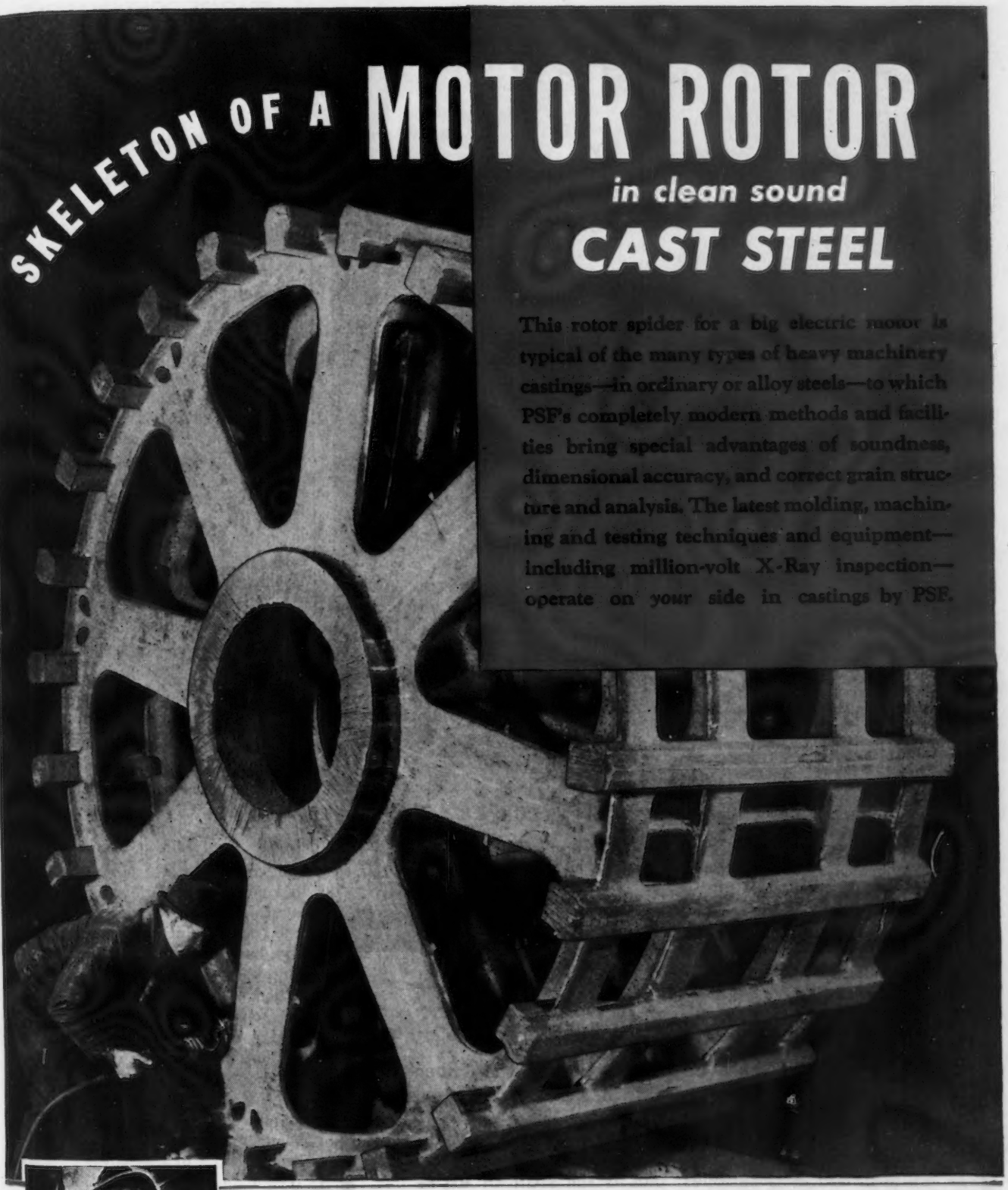
When Anozinc is exposed to the salt spray, salt can diffuse down to the zinc metal but nothing visible happens until all the soluble chromates in the coating are leached out. At this point, hair-line attack of the base metal begins and slow formation of white corrosion results, but spreading of corrosion between cracks is very slow; whereas, in the case of the chemical dip coating, the salt spray solution also diffuses through the cracks, but, on coming in contact with the intermediate layer of dry salts under the coating, the salt solution spreads in all directions quite rapidly because of the intermediate alkaline hygroscopic layer, with the result that general corrosion takes place almost immediately.

In chemical coatings, a glossy, jet black (Unichrome black dip coating) has been developed. The coating is uniform, hard and pleasing in appearance. The process consists of a chemical dip solution operated at room temperature, whereby in a single treatment a jet black color is obtained on zinc or cadmium in from 1 to 5 minutes. The bath is made up from dry salts and is stable, well buffered, and extremely tolerant to foreign impurities. No oil or subsequent coating is required and the corrosion resistance is excellent, particularly for a black coating. It com-

SKELETON OF A MOTOR ROTOR

in clean sound CAST STEEL

This rotor spider for a big electric motor is typical of the many types of heavy machinery castings—in ordinary or alloy steels—to which PSF's completely modern methods and facilities bring special advantages of soundness, dimensional accuracy, and correct grain structure and analysis. The latest molding, machining and testing techniques and equipment—including million-volt X-Ray inspection—operate on *your* side in castings by PSF.



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UDYLITE NEWS
WASHINGTON ROUND-UP
HERE IT IS!
The new, Udylite full automatic plating machine.
Udylite's engineers really "hit the jack pot" when they did this job.
It's a compact, multi-purpose piece of equipment—small enough to move easily wherever needed—so low in cost that everyone can have one or a half dozen as needed.
NOW, you really can't afford NOT to own a full automatic.
This new machine has more unusual features than we can tell you about here, yet basically it is built on time-tested principles using the best features of some of Udylite's finest existing equipment.
It's self contained, shipped assembled, in one freight car, ready to set on your floor.
Write for our detailed bulletin on this machine. We'll gladly answer your questions.
THE UDYLITE CORP.
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This new full automatic is the latest evidence of Udylite's leadership in the development of finer metal finishing equipment.

You'll find Udylite's complete line of dependable equipment and supplies, plus a full staff of experienced engineers and electro chemists, a combination hard to beat.

Call on Udylite for your metal finishing requirements—no job is too large for our facilities nor too small for our careful consideration.

pares favorably with Anozinc coatings and is applicable particularly to bulk work.

Colored Anodic Coatings on Aluminum

F. P. Summers of the Sandoz Chemical Works, Inc., delivered a paper on "Dyestuffs," from the standpoint of coloring anodic coatings on aluminum.

In the past all that was required in a dyestuff was a substance with reasonable light and wash fastness. Today, however, dyestuffs, in addition to the above standing, must withstand bichromate after treatment, as well as other special specifications. Many of the dyestuffs formerly used for sulphuric acid anodizing were unsuited for chromic acid anodizing; these two methods of anodizing yield different coatings. Uniform anodizing must be produced. If not, the coating will vary and this will involve the dyestuff used. Also, in this type of work, it is often more economical to dump baths at frequent intervals to avoid "off color" work. The amount and cost of chemical is not high, and rejections are costly.

The preparation of the bath is simple, if the following common practice in the textile field is adopted. Paste the known weight of dye in a small amount of hot water. Add this to a known volume of water in a crock and stir; this will give you a concentrated stock solution. Make up a known volume of water in the dye kettle and add a given quantity of the stock solution to complete the dye bath. Any measuring dipper is suitable for measuring the stock solution. One stock solution should last for some time.

It is important to control the baths so that the color content will be constant. First of all, the dyestuff employed should be tested against a standard. For each separate color being used, select a standard, and keep a bottle of this powder on hand. Weigh up a solution of the strength adopted, namely, 1, 2, 4 or 10 gm. per liter. On the new shipment make a similar solution. Dip in each of these a piece of filter paper approximately 6 in. long by 2 in. wide. Immerse only one-half way. Then remove same and observe. A difference will be apparent in shade or strength or both. This same test can also be used in determining the strength of the dye bath.

Keep a standard solution of the strength of the new bath. Then, at

READY-POWER MAKES TRUCKS GO!

Power Units Only

READY-POWER
THE GAS-ELECTRIC POWER PLANT FOR ELECTRIC TRUCK OPERATION

READY-POWER UNITS
NOW OPERATING THROUGHOUT
ALL TYPES OF INDUSTRIES

READY-POWER is Live Power in unlimited amount. Generated as needed directly on the truck chassis (not stored and limited in amount) was made available by us in 1924, for the users of electric industrial trucks. Through this source of power (Ready-Power), the electric industrial truck is pre-eminent today as the most efficient, long-lived, most flexible material handling tool available to industry.

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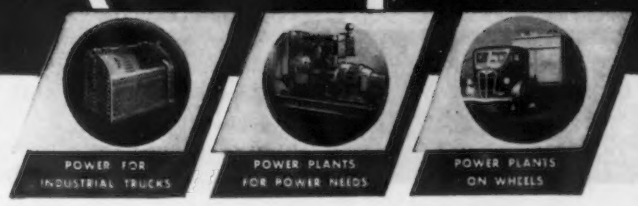
THE READY-POWER CO.



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TORRINGTON
Force Feed Mechanical
LUBRICATOR

Positive, never-failing force-feed bearing lubrication. Design flexibility also enables power takeoff from machine to front, rear, side or bottom by ratchet or rotary means. For complete information write, stating number of feeds and drive desired.

THE TORRINGTON
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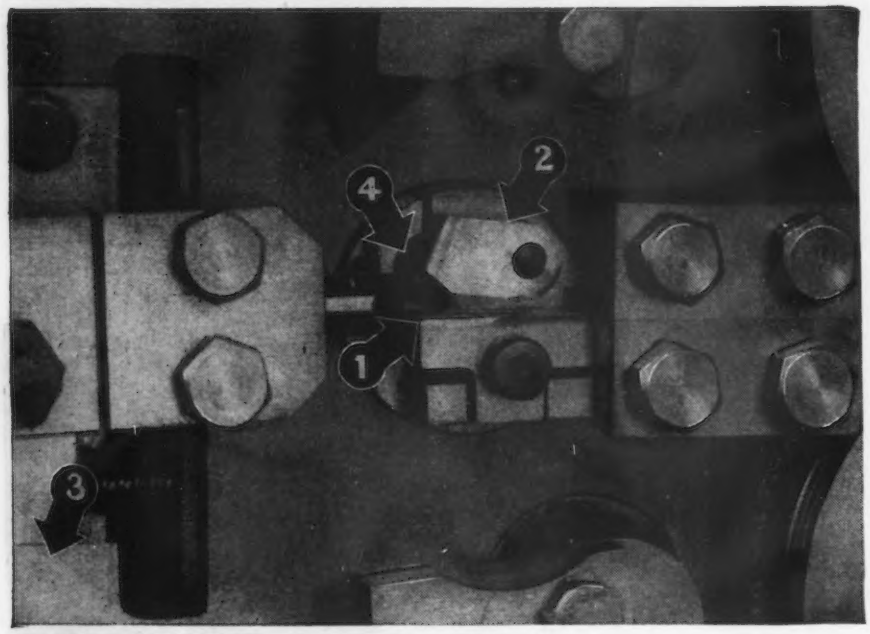


HELPS TO GREATER ACCURACY *in Spring Coiling*

No. 5 Spring Length

Every possible physical safeguard for accuracy is provided in the Torrington Spring Coiler. With reasonable care and preventive maintenance any Torrington Coiler will continue for many years the rapid production of accurate, uniform springs.

1. Block wire guide groove size is directly relative to final accuracy. For best results this groove must fit the wire diameter within a few thousandths. The poorer the fit, the greater variance in the springs coiled.

2. Pitch tool movement must be to the same limits constantly. Loosened parts or wear may cause variance. This may be checked by placing an indicator on the tool face and checking the tool's uniformity at the low and high points of its travel.

3. Pitch and diameter lever cam rolls must run true and free. Due to the fact the cams bear alternately on each side of the rolls, any appreciable wear in the roll stud may contribute to inaccuracy by tipping the cam roll.

4. Keep the arbor up to a sufficient size to avoid bending the end of the wire when it is cut.

August 17th—*End Squaring*

THE TORRINGTON
MANUFACTURING COMPANY
TORRINGTON, CONNECTICUT

2-hr. intervals, dip a piece of paper into the dye bath and compare that with the standard.

The milennium will be here when dyestuffs of all shades will be usable for both sulphuric and chromic acid anodizing; will be set with the standard after-treatment, and will withstand the bichromate sealing without change in shade! This will mean, one red, one blue, one green, etc., for all purposes.

Anodizing of Aluminum

Albert R. Goodkin, All-Brite Chemical Co., Waterbury, Conn., read a paper on Anodizing Aluminum.

By far the most important of the chemical treatments for aluminum is the anodizing process, which involves the formation of an oxide on the surface of the metal by electro-chemical means, usually in an acid bath. Direct or alternating current or both may be used because of the electrical valve action of aluminum oxide, which allows passage of current in one direction only. When direct current is used, the work is made the anode with the tank itself or any other convenient conducting material as the cathode. Where alternating current is used the work is suspended on two bars which are both anode and cathode.

Aluminum is anodized for the purpose of increasing its resistance to corrosion and abrasion, to provide a receptive medium for coloring, painting and dyeing, and to obtain an electrically insulating surface.

Films of aluminum oxide have the unusual property of absorbing or adsorbing organic dyes and mineral pigments. By immersing in suitable solutions anodized aluminum may be colored or dyed in an exceedingly attractive manner.

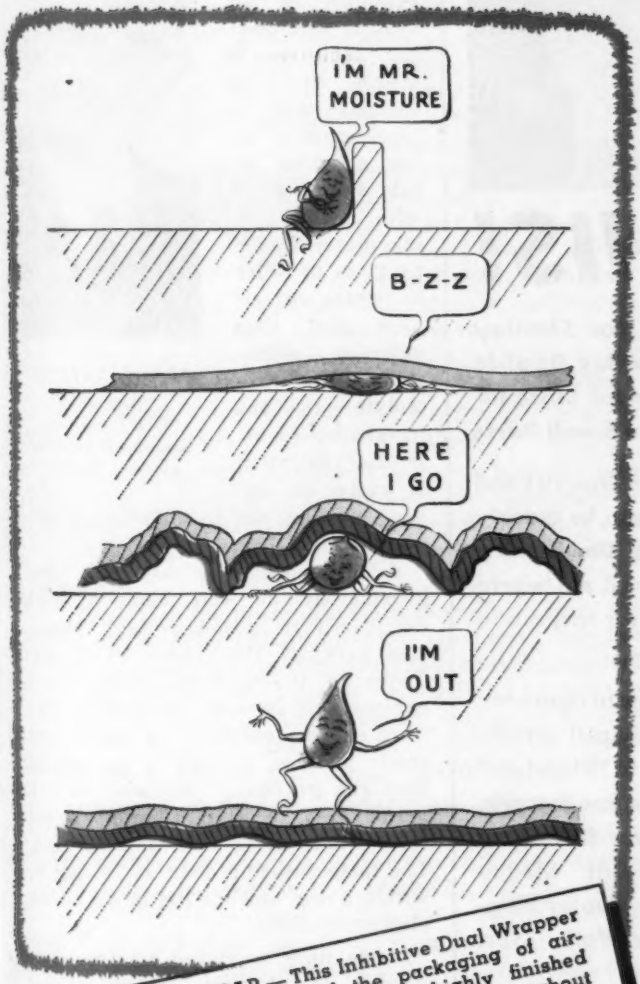
The anodizing process is almost the exact opposite of plating. The work is the anode and nascent or highly reactive oxygen is liberated at the anode and reacts with the aluminum to form the oxide film. After the first film of oxide is formed, oxygen must penetrate it in order to react with a fresh aluminum surface. For this reason the voltage must be increased gradually as the film is forming in order to go through the relatively porous oxide layer which has already been procured. Aluminum dissolves in the electrolyte as the process proceeds with equilibrium eventually being reached between oxide formed and aluminum dissolved.

One of the most widely used com-

Induwrap*

GIVES ARTIFICIAL RESPIRATION TO STEEL

...kills corrosion



INDUWRAP — This Inhibitive Dual Wrapper has revolutionized the packaging of airplane engine and other highly finished metal parts shipped to points throughout the world.

WRITE TODAY for sample and free descriptive folder, "The Touch of Death to Steel" — Folder (IA). Anticipate your peacetime needs when ANGIER INDUWRAP will be generally available to industry.

Who would have thought it — highly finished steel needing to breathe!

But it does. At any rate, that's the theory of Angier Protective Engineers and other competent packing authorities. Experiments have found a way to let packaged steel breathe, and many tests have demonstrated that breathing, as permitted by INDUWRAP, is an effective first-aid against the contamination of steel by corrosion.

Let's see how Mr. Moisture makes it work: Under a tight-fitting flat wrap, Mr. Moisture is squashed against the steel surface — trapped there on a spot where the protective oil film may be broken. Corrosion starts its deadly work.

But note how different it is when the wrapper is creped — when it S-T-R-E-T-C-H-E-S. In the little air channels between points where it touches the steel, Mr. Moisture finds elbow room to wiggle out — evaporate from his prison, leaving the broken "spot" in the oil film protected by the A-25 infusing compound in the INDUWRAP wrapper.

"What is the source of this moisture?" you may ask. Well, it may fight its way out of pores in the metal, or come from solvents in the oil compound with which the metal is slushed. It may make its unwelcome appearance from many places, and it does. INDUWRAP — creped and with its corrosion inhibitive metal-contacting surface — is safe insurance against this trouble-maker.

Then there are other decided advantages in using a creped, resilient wrapper. It is flexible and conforms neatly to the protruding parts of odd-shaped articles, without puncturing or tearing. And it helps to cushion the shocks of travel.

*REG. U. S. PAT. OFF.

ANGIER CORPORATION
CORROSION PREVENTIVE AND WATERPROOF PAPERS
FRAMINGHAM, MASSACHUSETTS

Angier

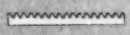
LOOK INTO THIS!

A "Super Lens" — Accessory for Stanley "Flud-Lite" Magnifiers — Provides Double the Former Magnifying Power for Close Inspection or Assembly Work on Small Parts

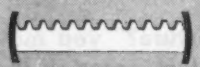
Stanley "Flud-Lite" Magnifiers, Nos. 701 and 701H, widely used in industry, can be quickly doubled in power by attaching the Stanley Auxiliary Lens No. 05. Here's real aid where extra magnification is required for inspection or fine assembly.

The Auxiliary Lens, 2½ inches in diameter, is securely anchored in a cup-shaped attachment and can be easily attached to "Flud-Lite" Magnifiers No. 701 or 701H in a few seconds. Ask your distributor, or send for illustrated folder describing Stanley "Flud-Lite" Magnifiers and Auxiliary Lens No. 05. Stanley Electric Tool Division, The Stanley Works, New Britain, Connecticut.

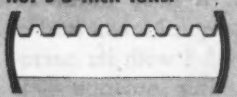
HERE'S WHAT IT DOES—



Milled rack as it appears to the unaided eye.



The same rack under the "Flud-Lite" Magnifier's 5-inch lens.



Super-magnification is obtained through the use of the 2½-inch Auxiliary Lens attached to the Magnifier.

STANLEY

TRADE MARK

STANLEY ELECTRIC TOOLS

mercial processes for anodizing aluminum utilizes chromic acid as the electrolyte. The simplicity and low operating costs account to a large degree for the extensive application of this method in the aircraft industry on parts containing less than 5 per cent copper. Another factor is that any chromic acid remaining on the work after rinsing is not corrosive and will actually assist in retarding corrosion.

FRANK SAVAGE
Second Vice-President American Electroplaters' Society

A steel tank, equipped with heating and cooling facilities is used as the cathode with a large portion of the effective inside area covered with an insulating material such as glass in order to reduce cathode area and thus minimize reduction of the electrolyte to the trivalent state. Gentle agitation is useful to prevent burning and to maintain a uniform temperature.

A dc generator or rectifier of approximately 50 volt capacity and equipped with suitable voltage regulation provides the source of power. Three to 10 per cent solutions of chromic acid serve as electrolyte. The work to be anodized is made the anode and low voltage is applied at first and gradually increased over a period of 7 to 10 min. to about 40 volts where it is held for 30 min. The temperature is kept at 95 deg F. within 5 deg. and the pH at 0.8 to 0.9 electrometrically.

Oxide films produced by the electrolysis of chromic acid solutions are relatively thin, ranging from 0.0000012 in. to 0.00008 in. with about 0.00002 in. of film being of commercial importance. The opaque gray film formed in this manner is not as hard as that obtained from the sulfuric acid process but provides better corrosion resistance, probably due to inclusions of CrO_3. Chromic acid coatings do not lend themselves readily to dyeing although it has been demonstrated that they can be dyed.

In the sulphuric acid process a lead lined steel tank is used and the equipment in general is the same as that for the chromic acid method except that the voltage required is consider-

IN BOLTS AND NUTS OF STANDARD TYPES THAT CAN MAKE A GREAT SAVING FOR YOU IN ASSEMBLY TIME!

At left, we introduce you to the Lamson heel bolt and tail nut—one of the first standard specialty bolt and nut products—used in America for generations past. It was a standard nut for a very special purpose when Manilla Bay and Dewey were yet to make history. And it is still used in respectable quantities in the South! What is it for? How is it used? Very simple, Mr. Modern Engineer. The nut is a *replacement* for nuts used by farm implement manufacturers, and because farm labor lost a lot of monkey wrenches in the cane and cotton fields, this nut was designed long ago to enable the user to slip a corn cob or stick through the "tail" of the nut, and tighten or remove it!

American ingenuity has never been at a loss for long in meeting some special problem. Consider each of the Lamson specialties shown at the left. Each one was a solution to a problem that had arisen in American industry.

For instance, there's the Dardelet Rivet-Bolt. Until the famous Dardelet Thread-lock was employed, only hot rivets were used in steel construction of buildings and bridges. Now the Dardelet Rivet-Bolt provides a riveted structure as sound as any hot riveted job—largely because of the patented thread used in bolt and nut, combined with the splined shank.

Then there are pre-assembled lock washer screws. Stamped or helical spring washers are assembled to stay on the bolt or screw before it is threaded, making a complete, inseparable unit, requiring only one inventory for both screw and washer. Then there is the self-tapping and sheet metal screw, which cuts its own thread in sheet steel, plastics and other materials. And then there is the Clutch Head and Phillips Head—which can be incorporated in any screw, including self-tapping and pre-assembled screws.

But these are not all. There are also Lamson Lock Nuts, which have been used successfully at elevated temperatures up to 850° Fahr., and Lamson Weather-tight Bolts, which seal wood surfaces against moisture and make a better, tighter, smoother assembly than the common Carriage Bolt.

Each one of these standard "specialties" contributes something unique to modern demands of industry, but all have one common attribute—*they speed up* assemblies. And, of course, if you can design to use one or more of these Lamson "specialties", you will gain all the advantages they offer. For more information about any or all of them—write us.

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They know that "shotgun coverage" gives them extra compression and excess refrigerant (which they can't utilize) at a higher initial cost . . . Kold-Hold's precision processing, obtainable with Kold-Hold Sub-Zero machines, assures you efficient handling of the job for which the unit was intended . . . Here are several suggestions from Kold-Hold's Standard lines.

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2.0 & 4.0 Cu. Ft. capacities at —45° & —60° F. Kold-Hold's most popular models. High efficiency, low cost maintenance and portability have established their acceptance in rivet storing, aging of steel and steel parts, chemical processing and pitch removal from optical lens. Designed for heavy duty.

1100T45

5.4 & 11.0 Cu. Ft. Capacities at —45° & —60° F. Virtually every application utilizing sub-zero processing can use these units to good advantage. Wherever —45° to —60° F. temperatures in these capacities is specified for cold processing, Kold-Hold units in this series are selected. In expansion fitting, aging of metals, aluminum alloy storage and numerous other applications, these machines provide reliable, fast, efficient low temperature performance.

505T75

5.0 & 11.0 Cu. Ft. Capacities at —75° & —90° F. For real "bottleneck-breakers" these Kold-Hold machines are unequalled in processing and testing of materials (including expansion fits, stabilizing steel and hardening of metals). Portability of these machines plus convenient working height makes them adaptable for use anywhere on production lines.

Let Kold-Hold engineers help you determine which capacity and temperature is best suited to your cold processing application.

KOLD-HOLD MANUFACTURING CO.

**Engineered for Production*

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ably lower and that alternating current with or without addition agents may be used. The acid concentration varies from 5 to 35 per cent by weight with strengths ranging from 15 to 25 per cent being most commonly employed. Low acid concentrations give harder coatings while softer and more porous films are produced in the stronger solutions. In general about 18 per cent acid by weight is the most desirable electrolyte when the oxide is to be dyed. The temperature is maintained between 74 deg. and 82 deg. F. by means of a cooling system and the voltage usually ranges from 12 to 18. The current density averages 8 to 12 amp. per sq. ft. and the time of processing from 20 to 50 min. Voltage is the primary controlling factor influencing the growth of oxide film in anodizing, and current density seems to have little if any practical significance.

To improve resistance to corrosion and abrasion sulfuric acid coatings which are not to be dyed are "sealed" in boiling water for about 20 min. or in a hot 5 per cent solution of sodium dichromate where a yellow color is not objectionable and where additional resistance is desired. In this manner the porosity of the oxide is markedly reduced and the surface is effectively sealed against further inclusions. For this reason hot water rinses prior to dyeing should be avoided for best results. Cold water with agitation of the work is entirely sufficient.

Aluminum anodized in sulfuric acid solution is hard, light in color, closely adherent, and relatively thick. Films range from 0.0001 in. to 0.001 in. with a thickness of about 0.0004 in. obtained in the normal commercial cycle. This type of oxidation will give substantial protection for years on outdoor exposure and almost indefinitely indoors.

Oxalic acid coatings have a grayish cast, give excellent protection, and are of the same order of thickness as those formed in chromic acid. Sulfuric acid types are considerably thicker and much more suited to dyeing. Higher voltages are required and alternating current is usually employed. Oxalic acid or alkali oxalates, 1 to 9 per cent, are the conducting solutions while voltages of 24 to 100, a.c. or d.c. are possible. The temperature is controlled to be less than 86 deg. F. at all times and the time of processing is approximately one hour. Although either type current can be used, direct current is the more efficient.

(*Continued on page* 142)

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We believe in that kind of thoroughness. Our customers are sold on it. They benefit from the quality product made possible by this manufacturing policy.

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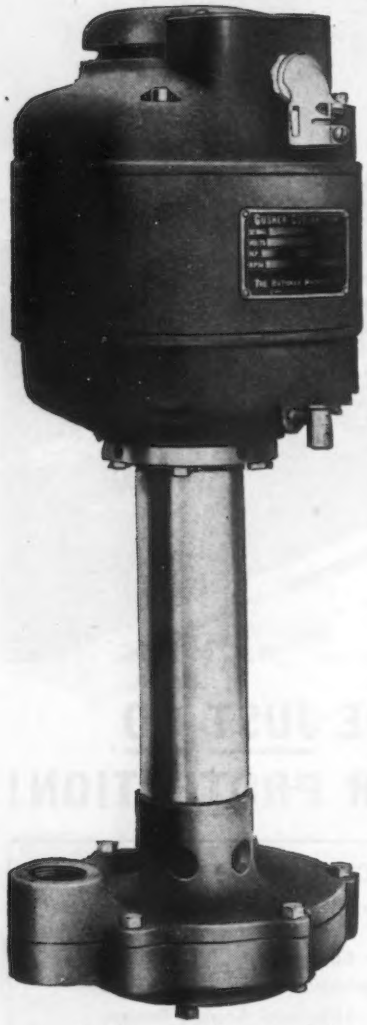
GUSHER COOLANT PUMPS



Plant records of some of the country's largest factories show that Gusher Coolant Pumps require minimum maintenance. This is due to the simple design, with few parts and no bearings within pump itself, elimination of all packing nuts, no metal-to-metal contact, no relief valves. The result is less friction, less wear, longer life, minimum maintenance. From a dribble to 200 g.p.m., with no leakage—1/30 to 2 H.P., there is a Gusher model and type for your special needs.

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Model TL-7320

See Section 2 of new catalog, indexed for quick reference.

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The "Gusher"—A Modern Pump for Modern Machine Tools

FEATURE CONTINUATIONS

All three methods of anodizing are in commercial usage at the present time with oxalic acid procedures finding their principal application in the formation of coatings for the deposition of other metals on aluminum.

A.c., d.c. or superimposed alternating current may be used for anodizing. In commercial practice, d.c. has been found to be the most efficient. However, there is the disadvantage of aluminum dissolving in the bath with resulting decreases in the thickness of oxide and contamination of the electrolyte. Alternating current is faulty in that it is comparatively slow, although there is on the market a proprietary a.c. sulfuric acid process claiming to be more rapid. Both types of current can be combined in the form of superimposed alternating current where a.c. and d.c. are impressed simultaneously on the anode. This reduces the tendency for the dissolution of aluminum in the electrolyte, and consequently gives thicknesses of the same order but in less time than can be obtained with a.c. alone. Superimposed alternating current requires 60 to 90 volts d.c. along with 60 to 120 volts a.c. where the electrolyte is oxalic acid. It is probable that a superimposed alternating current of considerably lower voltage could be used to advantage in sulfuric acid anodizing.

R. J. O'CONNOR
Third Vice-President, American Electroplaters' Society

A typical cleaning cycle is represented as follows:

(1) Degreasing, vapor type or solvent.
(2) Mild alkaline cleaner, 2 to 4 oz. per gal., 180 deg. to 200 deg. F., or where etching is required,
(2a) Caustic soda, 5 to 15 oz. per gal., 160 deg. F.

Note: Castings and high silicon alloys are etched in mixtures of one part hydrofluoric acid and three to eight parts nitric acid at room temperature.

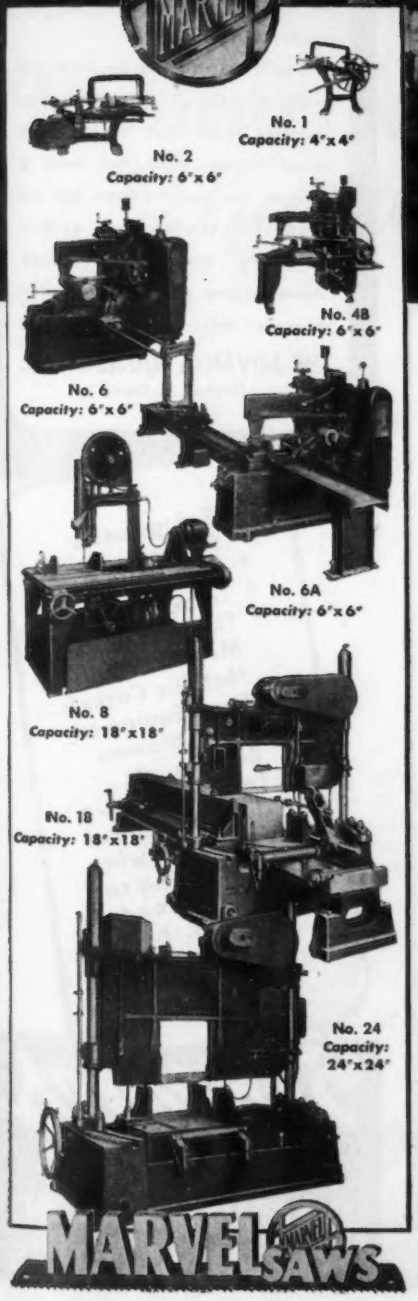
(3) Nitric acid dip, 5 to 50 per cent.

Note: The work is rinsed thoroughly in cold water after each operation.

Aluminum cleaned in this manner is properly prepared for anodizing.

Anodized aluminum can be colored easily by means of organic dyes or inorganic mineral pigments in double decomposition reactions. Of the three processes already discussed, coatings produced in the sulfuric acid electrolyte are the thickest, most absorbent and the most adaptable to dyeing.

(*Continued on page* 144)



2 men now do the work of 4 and save forging steel too

The Ajax Steel & Forge Company, Detroit, has solved its cutting-off problems with a battery of MARVEL Saws. Before, billets were cut-off with a hammer—an operation which not only required at least four men and tied up hammers and furnaces, but also resulted in the waste of a great deal of forging steel.

Now two operators with seven Marvel Saws supply the entire plant with billets cut to exact size from bars up to 18" x 18" square. In addition to their present Marvel Saws, five of which are illustrated above, this company is adding a super-giant MARVEL No. 24 Hydraulic Hack Saw—the new mammoth saw that quickly cuts off the toughest steels in sizes up to 24" x 26" cross section.

Our local MARVEL Sawing Engineer will gladly call at your plant, study your metal cutting problems and make recommendations as to methods and equipment. Write for new Catalog.

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FEATURE CONTINUATIONS

Films that are to be dyed are rinsed thoroughly in cold water after anodizing and then neutralized in a 1 per cent solution of ammonia or ammonium bicarbonate at room temperature. The work is again rinsed in cold water and then introduced into the dye bath maintained at 160 deg. F. to boiling, where it is kept for 15 min. to 1 hr., depending upon the dye and the temperature being used. After completely rinsing in cold water to remove excess of dye, the work is sealed in boiling water or, where better protection is desired, in a hot 1 per cent (by weight) solution of nickel acetate, after which it is rinsed in hot water and dried. Coatings which are colored in this manner are in general durable for outdoor exposures especially if impregnated with wax or lacquer and will last almost indefinitely indoors unless physically injured.

The so-called mordant dyes have been used most effectively, but all other basic or acid dyes which react favorably with hydrated aluminum oxide may be utilized. In choosing the proper dye, fastness to both sunlight and artificial light and the effects of perspiration, heat and chemicals are some of the factors to be considered, besides actual color. In actual operation the pH of the bath plays an important role, so that dye tanks must be kept from the immediate vicinity of anodizing and plating solutions. Where light shades are being produced, it may be necessary to have a separate enclosed area for the dyes and accessory solutions.

In cases where extreme durability of color is of vital concern, inorganic pigments are often advisable, since they are less susceptible to fading and other changes. Two consecutive solutions are used in coloring the oxide layer with mineral pigments. By using lead acetate solution as the first, yellow may be obtained with sodium chromate or dichromate; white, with zinc sulfate; and dark brown with ammonium sulfide. Potassium ferricyanide in conjunction with solutions of iron salts yield blues, while blacks are obtained with cobalt or nickel compounds followed by treatment with ammonium sulfide. A light buffing may be necessary to produce colored coatings with a high degree of gloss.

Anodized coatings are sensitive to light, and by treating with silver chloride or bromide, excellent pictures may be taken with aluminum as the photographic plate. The aluminum must be almost 100 per

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Using Strenes Metal, we'll cast your dies to shape, (usually to 1/16") and save you around 50% to 75% on machinery time. What's more you'll put to work a die that will stand up—draw and form far more stampings than you probably believe possible. Deep draw runs of 1,000,000 and more parts a matter of record.

You'll be using a die that will require redressing far less frequently than dies of ordinary metal. Sounds good, but, hard to believe, you say! Perhaps. But our suggestion stands "Toss us that tough one" and pay for it when Strenes makes good as claimed—otherwise there will be no charge.

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Refrigerators
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DRAWING AND
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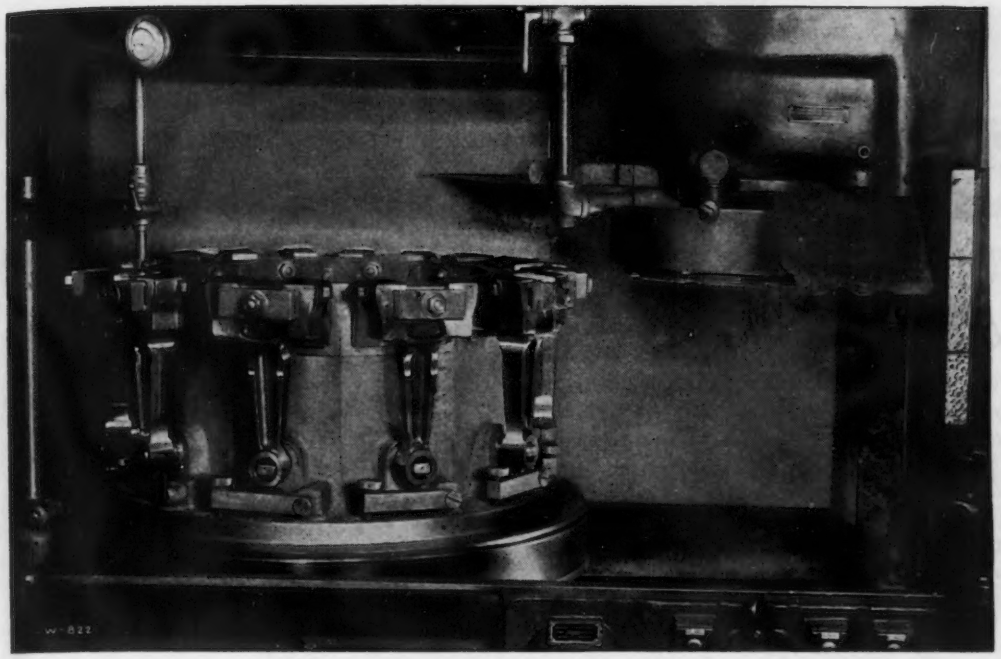

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Grinding Nickel Steel Forgings

These are master rods for an 1830 H.P. radial engine.

Formerly they were milled and finish-ground, one at a time, at the rate of 15 to 20 minutes each.

Now they are ground, 10 at a time in a special fixture, on the No. 18 Blanchard Surface Grinder which removes 3/8" of metal and turns them out at the rate of 4 minutes each.

This is only one of the many airplane engine parts that are being ground on the Blanchard, using magnetic, hand-clamping or automatic fixtures.

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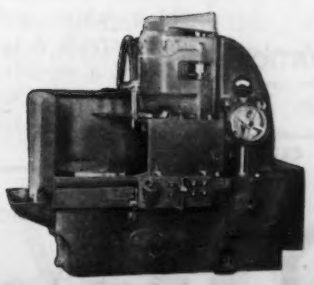
Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



This job being done on the No. 18 Blanchard Surface Grinder

The BLANCHARD MACHINE COMPANY

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Add Corbin to power driving and you're on your way to breaking speed records in your assemblies. From analysis of the steel to final packing, skilled hands and alert eyes bring to Corbin Screws the flawless uniformity that steps up speed — and accuracy — in mass fastening.

Look to CORBIN for your requirements in Screws and Nuts . . . a full range in both REGULAR SLOTTED and CORBIN-PHILLIPS Also AIRCRAFT Screws to Governmental specifications.

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The American Hardware Corporation, Successor
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cent pure and best results are obtained by anodizing in chromic or oxalic acids or in a series of both with oxalic acid last; sulfuric acid is not satisfactory for this purpose. In this manner, hard, corrosion resistant, and fire-proof photographic films have been produced which should have many practical applications.

Important research activity in this field is now being directed toward the introduction of comparable immersion processes (no current) for oxidizing prior to coloring and dyeing, and in the manufacturing end, toward the more extensive use of "aluminum clad" steel of fabrication purposes.

Welding For Postwar Construction

(CONTINUED FROM PAGE 73)

many) will be called in to do this work.

Engineers who are old enough to remember the "beating" they took from owners who wanted reinforced concrete when they were trying to sell them the idea that a steel frame job was much better, because they did not feel that some of the contracting organizations who might get the reinforced concrete job could build a safe one, are going to be in a tough spot on this matter of welded structures if their experience with reinforced concrete is to be repeated.

They know they are going to be in a tough spot because they will have to put up with all kinds of amateur structural organizations undertaking the fabrication of welded structures.

It's the same old story that an economical product cannot be kept off of the market, be it reinforced concrete or welding or low cost autos.

The writer hopes this time the fabricators will not just try to "brush it off" for you cannot brush off something which will help to save an owner from 5 to 15 per cent of the cost of a structural steel frame any more than it was possible to stop reinforced concrete.

Harding Appointed Director

Washington

• • • W. L. Clayton, Surplus War Property Administrator has announced the appointment of Lt. Col. William B. Harding as director of the SWPA Aviation Division. Colonel Harding will, for the present, be on military detail from the Army Air forces.

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These cold-worked blanks by Corbin are both stronger and much more economical than machined blanks because they have been *formed scientifically*.

The great saving of metal is obvious. But to divert the steel so that its flow is *evenly* directed through one or more thin sections requires expert skill and complete knowledge of cold-working. Otherwise the metal may be "overworked," and brittleness will result.

For *your* special parts, come where engineering excellence, functioning through thousands of the most modern machines, guarantees technical results of the very highest standard.

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Some of our facilities may be available *now*. Send us your blueprints and specifications for prompt, helpful study of your precision requirements.

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Signal Corps Photo

● Remember Pearl Harbor? And the terrific losses the Jap air raiders inflicted on our grounded planes at Hickam Field in Hawaii, at Clark and Nichols Fields in the Philippines? A holocaust, yes . . . but one that will never happen again!

For today, if enemy planes do get through, we have the most effective anti-aircraft defenses ever devised. Our deadly guns—like the 40 mm. anti-aircraft—have scored amazing numbers of "kills" in practically every action against the Axis in the last two years of war.

A rapid firing automatic weapon generally used with a mechanical director, the 40 mm. hurls high-explosive shells a mile or more with such unbelievable accuracy it has become a favorite among the men of our Anti-Aircraft Command. And like countless other weapons of war, these guns have reached the front *faster* because so many of their manufacturers selected high-speed DeVilbiss Spray Equipment for all painting operations.

Tomorrow, when time saved in painting or coating your products of peace will mean lower manufacturing costs in a competitive market . . . remember the record of DeVilbiss Spray Equipment in war. And if your planning for this tomorrow has already begun, let a DeVilbiss engineer confer with you *now*.

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Chicago Detroit New York

Investigation Shows Reconversion To Civilian Production May Be Slow

Cleveland

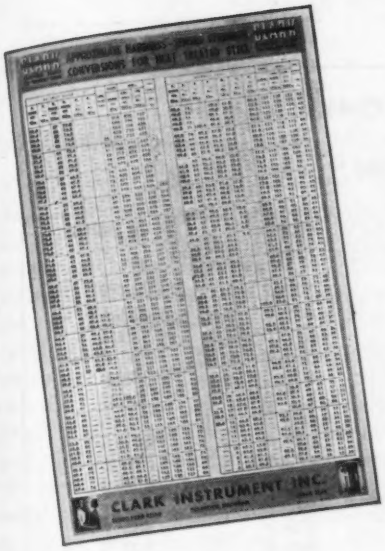
• • • **Reconversion** to civilian production at full production levels may be slow for intangible as well as tangible reasons, investigation here reveals. The time lag required by physical reconversion is only one factor. The replacement of lost skill, know-how and technique in the workers has already been proved a retarding factor by some firms which have been permitted to return to limited production of civilian goods due to the urgent need in civilian channels.

One manufacturer of warm air heating furnaces which had been permitted to produce limited quantities for civilian requirements undertook to do so nearly a year ago. This had to be accomplished in the most part by green workers that had never built furnaces before. The blue prints were complete, working instructions were adequate, yet the first furnaces off the production line were unfit for service because they were improperly assembled. The imperfections were not a matter of poor design or mechanical difficulties but were minor adjustments that are made by an inexperienced worker. This condition was corrected by training but nearly a year has been required to bring production up to the peacetime volume levels.

A motor manufacturer formerly engaged in making tractor and implement internal combustion motors has been turning out high precision engines of similar type since early in the war. Although the type of motor is almost identical, it is now made to government specifications requiring close tolerances with a high rate of discard for slight imperfections. This company finds production about half its previous volume, costs about twice as high and performance no better for the engines. The company expects to take a year to get men out of the habit of rejecting parts for a micro-inch imperfection and accustoming them to putting motors together on a true production basis based upon cost cutting.

Another observer states that automobiles for at least a year after production is first resumed may expect to show a high percentage of "lemons." This will be due entirely to the inexpertness of assemblers that haven't built automobiles for several years, if ever. This might also be true of many consumer durable goods including radios, refrigerators, irons, etc. Much of America's know-how, an undefinable technique of doing things right out of familiarity, has either gone to war or has grown rusty from lack of familiarity with the work, some observers believe.

ENGINEERING CONFERENCE: *Chromalox Engineering and Service representatives from the United States and Canada gather in Pittsburgh for their annual sales and engineering conference of the Edwin L. Wiegand Co. recently. In center foreground are E. N. Calhoun, president, (left); Bruce Fleming, vice-president of sales and (right) Mark Greer, vice-president of engineering.*



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FOR "ROCKWELL" TESTING

Rights of Returning Vets Outlined for Job Reinstatement

Washington

• • • **Taking cognizance** of the increasing importance of the problems of returning veterans entering the labor market, Selective Service headquarters has issued a memorandum outlining the rights of returned servicemen and the obligations of industry in regard to reinstating veterans in their former jobs.

The responsibility for aiding veterans in securing their old positions is put on the local draft boards. Upon being discharged veterans are informed of their right to call on local boards for assistance.

A veteran is entitled by law which has been upheld by the Federal District Courts, to reinstatement in his former position or to a position of like seniority, status and pay:

1. If his position was not temporary.

2. If he entered the military service subsequent to May 1, 1940.

3. If he is still qualified to perform the duties of such position. A veteran seeking his job cannot be asked to meet higher standards than existed when he left.

4. If he makes application for remployment within 40 days after his separation from service. This is mandatory and the 40-day period cannot be extended for any reason. The first duty of local boards is to inform tbe returning veteran of this provision.

Employers must rehire veterans without unnecessary delay and an employer is legally bound to take back returning veterans unless circumstances have changed to make it "unreasonable or impossible" to do so. Selective Service maintains and has been upheld by the courts that "convenient" must be distinguished from "unreasonable or impossible."

Veterans who are restored to positions must be considered as having been on furlough or leave of absence during their period of service; must not lose any seniority; are entitled to participate in insurance or other benefits offered by employers pursuant to established rules relating to employees on leave of absence; and they shall not be discharged without cause within one year after restoration.

If a veteran cannot reach an agreement with his old employer local boards are required to do everything in their power to reach an amicable

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On the other hand, if you are preparing aluminum parts for anodizing, FIRST immerse such parts in Oakite Aviation Cleaner to remove grease, oil or other foreign matter. THEN rinse, and place for a short period in Oakite Compound No. 84. This will thoroughly remove ALL heat scale, oxide film and discoloration.

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adjustment and may call on any local agencies for assistance. However, local boards may not institute any legal action, but must refer cases, where an agreement cannot be reached, to the state director, who will refer the case to the director of Selective Service for legal action.

A veteran may also file suit in the United States District Court if an agreement cannot be reached. He may employ his own attorney or the United States attorney will handle the case, without cost to the veteran, provided he is satisfied that the veteran's claim is just. A veteran may also recover back pay, by legal action, if his reinstatement was unnecesarily delayed.

An important point for all businessmen to remember is that Selective Service holds that the veteran has a legal right to accept a cash settlement in lieu of his old job, thereby relinquishing reemployment claims.

Another important ruling, which is being interpreted as an open slap at organized labor would prohibit the closed shop or maintenance of membership agreement from applying to returning veterans. According to the Selective Service official interpretation, if an employer has entered into agreements, which did not exist at the time of the veteran's separation, the veteran cannot be deprived of his reemployment rights because of such agreements. He is entitled to his old job even though a non-veteran with greater seniority will have to be discharged. It is reported that this provision caught the labor leaders napping, and that they have already scurried to the White House with anguished cries of "we're being robbed."

Index of Foundry Equipment Orders May, 1944

Net Orders Closed *

	New Equipment	Repairs	Total Sales
1943 May	274.3	573.7	348.9
June	355.6	609.2	413.6
July	320.9	577.0	379.4
August	341.0	556.9	390.4
September	268.7	621.0	346.6
October	375.7	650.9	436.6
November	328.0	600.3	388.0
December	396.5	605.4	442.8
1944 January	321.6	577.5	378.3
February	402.6	648.2	456.8
March	457.6	642.6	498.4
April	322.2	610.1	385.7
May	477.0	598.8	503.9

* 31 companies reporting

NOTE:—The foregoing figures are per cent of the 100 per cent base (monthly average) of reported sales to metal working industries during 1937-38-39. A practical comparison of figures on the old base (1922-23-24 figures) can be determined by multiplying new base figures by 1.328.

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outside your open hearth
WON'T MAKE STEEL inside -
Did you Know?
Over 50% of furnace wall radiation losses alone can be stopped? Therm-O-Flake Insulation is preferred for this work in most steel plants.
Here's why!
Highest insulating value — easy to apply — low maintenance — low cost — high reclamation — sticks tightly to silica or basic brick — permits closer control of fuel-air ratios — reduces cold air infiltration.
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Therm-O-flake
HIGH TEMPERATURE INSULATION
BRICK - BLOCK - COATINGS - CONCRETE - GRANULES

Review Job Classes For Returning Veterans

Cleveland

• • • **Midland Steel Products** Co., Cleveland and Detroit, has underway a program to determine how many of the 111 job classifications in its plants can be handled successfully by partially disabled veterans, it was announced today by E. J. Kulas, president of the company.

Midland now has 693 people in the Armed Forces, and 69 have been returned.

"A careful analysis, now underway, has shown that a fair percentage of our 111 job classifications can be handled by men who suffered battle injuries that would keep them from working at their old jobs," Mr. Kulas said.

Correction

• • • **Last week it was** stated in This Industrial Week that curtailment of the shell container program will effect a saving of about "100,000 tons of steel a month." The sentence should have read "100,000 tons of steel a quarter."

Without Warehouses Not a Distributor

Washington

• • • **New WPB amendments** to M-21-b-1 and M-21-b-2, effective July 15, point out that persons acting merely as brokers on sales of steel without regular warehouse locations are not to be classed as distributers. Issuance of the amendments leaves the steel warehouse virtually unchanged. Certain features of the orders are clarified and the restrictions formerly applicable to the purchase of alloy steel plates, tubing and hot rolled sheets have been removed. Distributers, however, are still limited in their purchases of these products in the carbon steel grade.

Radiographing Magnesium Alloy Test Bars

(CONTINUED FROM PAGE 75)

higher voltage gredients to be used than for normal materials. On one small radio transformer, for example, Fosterite provides four to five times the dielectric strength that was obtained with former materials. This permits a radical reduction in size and weight.

The elimination of voids in coils increases the heat conductivity of the structure. Preliminary experiments have shown that certain coils impregnated with the resin will dissipate as much as one-fourth more heat as coils impregnated with ordinary solvent-type varnishes. It is also insoluble in transformer oil and hence suitable for treating oil insulated coils.

In the following test of Fosterite moisture proofing, radio and radar components are subjected to hot and cold water submersion. The components are first placed in 149 deg. F. saturated salt water solution for two hr., then in a 32 deg. F. solution for another two hr., and the cycle is repeated five times. The insulation resistance must not be less than 75 megohms; the leakage current not more than 3 milli-amperes.

Surface coating has also provided a radical improvement in moisture resistance of such apparatus. By means of the coating and impregnation, the moisture proofness is said to be 100 to 1000 times better than by the use of the best previous materials.

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Beverly Hill, Calif.

O. H. Day Company
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Gierston Tool Co.
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Chicago 2, Ill.

Oliver-Ingalls Associate
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Production Tools Co.
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MACHINE TOOLS

. . . News and Market Activities

Shell Tool Orders Widely Scattered

Cleveland

• • • **The machine tool** portion of the heavy shell program is progressing nicely and orders for a good many millions of dollars have been placed and in part delivered. Despite the large figures being quoted there appears a wide gap to be bridged before the $600,000,000 estimated year for the machine tol industry is an accomplished fact.

Orders in this vicinity have reached only about $2 million for shell making tools; about $4 million has been placed in western Pennsylvania, another $1½ million in eastern Pennsylvania and between $7 and $8 million in the St. Louis area. While this picture is far from complete the total falls far below the amount necessary to inflate an estimated $325,000,000 machine tool volume to the revised $600,000,000 prediction.

Private sources indicate that machine tool deliveries are being made close to Army schedules and that the program as a whole will be functioning much as anticipated by fall. Deliveries on many machines are being made in 60 to 90 days and shell lathes are being produced on all sides rather than from the relatively few expected sources.

Large automatics are said to still be a major shortage item but the program is worse hampered by a lack of heavy forging presses. A large expansion in the base plug program has been required and fuze and booster makers are searching valiantly for tools. The base plug expansion would indicate a shortage of turret lathes although one maker states that inquiries for more than 100 turret lathes early in the program materialized into a very few orders due to extended deliveries. Thread chasers also are still reported very tight.

Many of the most seriously needed tools, particularly shell lathes, are being built by plants which in peacetime are not regular machine tool builders. Barney Machinery Co. of Pittsburgh, for instance, is reported to have grabbed off the $1,000,000 Kaiser machine tool order and to have farmed it out to several firms among which are the Cleveland Automatic Machine Co. and Federal Welding & Machine Co. The Barney concern has dealt in tools for years and since the war has developed a line of shell turning lathes. Federal Welder was in the boring mill program a year ago.

The John Hepburn Co. of Canada has helped the cause with about 250 shell lathes. Cross Co. are said to be very busy with a large order. Morey Machine Co., eastern tool rebuilders, are reported to have built about 7000 special purpose machines since the war began and is presently committed for 25 shell lathes per month.

•

Foote Bros. Approves Refund Of $3,200,000 for 1943

Chicago

• • • **The board of directors** of Foote Bros. Gear & Machine Corp., Chicago, has approved a refund of $3,200,000 asked of the company by the Price Adjustment Board of the Navy Department at a hearing held on June 9. This refund, less applicable tax credit, will require a net payment of $837,000. A provision of $750,000 had been set aside out of 1943 income for renegotiation on the company's gross sales of $26,284,943 for the fiscal year ending Oct. 31.

Net income for 1943 becomes $771,118, as compared with $686,114 in 1942 when gross sales were $18,368,181.

•

International Detrola Reports 23% Sales Gain First Half

Detroit

• • • **Six months net profit** of $643,774 after provision for federal taxes but before renegotiation is reported by President C. Russell Feldmann of International Detrola Corp. Figures were for the period ended April 30, 1944, and included four months operations of the Detrola Radio and Electronics Division which as Detrola Corp. was merged December 31, 1943.

Feldmann disclosed that sales registered a gain of $3,460,000 or 23 per cent over the comparable 1943 period. Against aggregate sales of $14,123,274.66, the net profit equals 4.56 per cent with earnings at a rate of $1.31 per share. Dividends of $0.50 per share were paid during the six months on the 490,000 shares of common stock.

Decrease in machinery sales of the company, which operates machine tool plants in Elkhart, Ind., and Indianapolis, reflected a period of transition to direct war production, Feldmann said. This factor was much more than offset by the upsurge of radio sales from $1,920,000 in the 1943 period to $12,796,433 in the 1944 half-year (includes two pre-merger months).

•

Detroit Tool & Die Shops Show Slight Decline

• • • **The tool and die** situation continues to loosen very slowly in Detroit, and employment in the special tool shops is drifting modestly lower due to draft requirements and job shifting.

A compilation based on reports from approximately 140 Detroit area shops shows that average delivery time on jigs and fixtures today is slightly over four weeks. At the start of the second quarter in April, deliveries in this class averaged a full 4½ weeks.

Gage delivery time continues to average 3½ weeks. Special cutting tools are being delivered between two and three weeks on an average, and in this category the delivery span is about three days longer, on the average, than during April.

Employment in the reporting shops totaled 9304 at the start of July. In this same group of shops the employment total at the start of April was 9615. During the first three months of this year employment had held steady, this being the first decline of consequence since the war began.

•

June Aircraft Production

• • • **Aircraft output** for June amounted to 8049 planes, a drop of 9.5 per cent from the May figure, according to a report by the Aircraft Production Board. Part of the drop is attributed to the shorter work month and to the failure of three companies producing smaller types of planes to meet schedules.

C. E. Wilson, chairman of APB, stated, however, that the production on an overall basis followed the pattern of the past several months, with an output in airframe weight of approximately 100 million lb., which compares with the record output of May of 102½ million lb.

ALL STANDARD SIZES

National Fine

National Coarse

0-80 to 1½-6

Also Pipe Plug Gages

⅛ to 1¼

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IF time is pressing and you need Standard Thread Plug Gages in a hurry to keep your war schedule going at top speed, we'll get them to you posthaste!

With a steady production, day in and day out, we usually have in stock for immediate shipment a complete range of all standard sizes from 0-80 to 1½-6, National Fine or National Coarse—also pipe plug gages ⅛ to 1¼".

Rush orders for any normal quantity are filled as soon as received—others within 24 hours at the maximum. Order by wire for your immediate needs—or mail requisition to cover your anticipated requirements.

CADILLAC THREAD GAGES

CADILLAC GAGE COMPANY

Detroit

NON-FERROUS METALS

. . . News and Market Activities

Platinum Is Conserved By Use of Palladium

• • • **The use of platinum** for jewelry has been prohibited by WPB due to heavy demands on that metal for purposes connected with the war, and the largest producer of the platinum group metals, International Nickel Co., is promoting the use of palladium for use by manufacturing jewelers. Palladium, next to platinum, is the most plentiful and widely used metal in the group and is less costly than platinum. During the last 20 years palladium has been used in constantly increasing quantities by the dental, electrical and jewelry industries.

There has been a material gain in the world output of the platinum group metals during the past decade due chiefly to improvements in metallurgical processes for refining copper nickel ores. In 1941, which is the latest year for which figures have been released, stocks of platinum and palladium have increased from 1939 approximately 110 and 370 per cent, respectively. Palladium stocks of 138,000 ounces were only slightly less than platinum at 150,000 ounces. Thus it was possible for industries to receive palladium when it was impossible for them to obtain platinum.

The demand for platinum for jewelry in 1941, according to the Bureau of Mines, was 66,000 ounces as compared with 8,000 ounces of palladium. The trend in buying of jewelry since that time makes it reasonable to assume that palladium now has a position in the field comparable in volume with that previously held by platinum.

Platinum Metals Sold in the United States in 1941, in Troy Ounces

Source: Bureau of Mines

Industry	Platinum	Palladium	Iridium, Osmium, Rhodium and Ruthenium
Chemical	68,285	3,312	
Electrical	29,363	35,456	
Dental	19,426	31,440	19,418
Jewelry	66,151	7,999	
Miscellaneous	7,845	667	
Total	190,075	78,904	19,418

Applications of Platinum

Chemical Industry
Catalyst—acids used for production of explosives
Laboratory ware
Rayon spinnerets
Nozzles for production of glass fiber
Linings for processing and reaction vessels
Hydrogenation of organic compounds
Glass insulators for electric light bulb base
Tubing, valves, siphons and safety disks for handling corrosive liquids and gases
Anodes for production of "per" salts
Gas analysis cells
Crucibles

Jewelry Industry
Rings, brooches, bracelets, earclips, watch cases, etc.

Electrical Industry
Thermocouples
Temperature measuring and recording instruments
Precision resistance thermometers
High temperature furnace windings
Spark plug electrodes
Magneto and other electrical contacts
Relays
Thermostats
Automobile voltage regulators and direction indicators
Switches for potentiometric recorders

Dental Industry
Tooth pins
Bridges
Bracing for artificial teeth
Matrices on porcelain inlays
Orthodontic appliances

Mexico Strike Terminating

• • • **Since the strike** of mine workers was called in Mexico on June 8, practically all the non-ferrous mines there have been closed down. While certain small producers in outlying districts have continued their production, the strike affected domestic stocks of lead particularly.

Operations have now been resumed to an extent permitting reasonable supplies to enter the U. S. It is believed by the industry that the strike will soon be concluded.

•

Manganese Mine in Production

• • • **The Three Kids Mine**, near Las Vegas, Nevada, owned by the Manganese Ore Co., a subsidiary of The M. A. Hanna Co., has proved to be the largest open pit deposit of good grade manganese ore in America. The mining operation has exceeded expectations as to quality of ore and tonnage, according to M. C. Lake, V.P. of the former.

A plant adjacent to the mine designed to beneficiate the ore is not yet in full scale production. Built for the Government by the Manganese Ore Co., and employing a chemical process never before attempted on a large scale, the plant has produced several thousand tons of the highest grade manganese nodules ever made. Full production is delayed by mechanical difficulties encountered because alloy steels and other acid-resistant materials were more urgently required for other war uses.

Ore exceeding the full contract quotas in tonnage and grade has already been delivered, or has been stripped and is available for immediate delivery.

•

Copper and Brass

• • • **At the Brass Mill** Industry Advisory Committee meeting recently, it was again emphasized that the alloy rod situation remains extremely critical and that every effort must be exerted to obtain sufficient production to supply Controlled Materials Plan requirements for the remainder of the year. Facilities for the production of rotating bands are also insufficient and a program for increasing production is underway. It was stated that it is becoming increasingly difficult to obtain sufficient manpower to meet schedules.

For the third consecutive month there was a deficit of copper necessary to meet CMP requirements, WPB officials pointed out. Demands and supply for copper remain in virtual balance and no improvement in this situation is foreseen if present requirements continue, members were told.

WPB has relaxed restrictions on fire protective, signal and alarm equipment, and on the metals that may be used in their manufacture. Order L-39 as amended permits the use of copper and copper base alloys for specified parts of equipment, chief among which are hose line fittings and fire hose couplings in sizes other than 1½ in. and 2½ in.

This return to copper and copper base alloy is permitted chiefly because of the shortage in the supply of malleable iron castings, WPB officials said. At the same time these resubstitutions will permit the filling of essential orders which hitherto could be filled only by appeals from restrictions on the use of copper and copper base alloys. The resubstitutions will also result in a better product.

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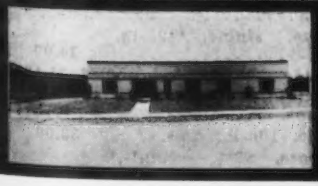

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REFINER, SMELTER PRICES

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd	15.00
Aluminum, No. 12 Fdy., (No. 2)	12.00
Aluminum, deoxidizing grades	11.00 to 12.25
Antimony, Asiatic, New York	Nominal
Antimony, American, f.o.b. Laredo, Tex.	14.50
Arsenic, prime white, 99%	4.00
Brass, 85-5-5-5 ingots (No. 115)	13.00
Cadmium, del'd	90.00
Cobalt, 97-99% (dollars per lb.)	$2.11
Copper, electro, Conn. Valley	12.00
Copper, electro, New York	11.75
Copper, lake	12.00
Copper, beryllium, 3.75-4.25% Be; dollars per lb. contained Be	$15.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$7.50
Iridium, dollars per troy oz.	$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	20.50
Magnesium, 12-in. sticks, carlots	30.00
Mercury, dollars per 76-lb. flask, f.o.b. shipping point or port of entry	$191 to $193.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.37	....	20.87
Copper, H.R.	....	17.37	...
Copper, drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier; 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness; 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals; ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums)

Copper, Copper Base Alloys

OPA Group 1

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25

OPA Group 3

Yellow brass soft sheet clippings	8.625
Yellow rod brass turnings	8.375
Zincy bronze borings	8.00
Zincy bronze solids	8.00
Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4

Automobile radiators	7.00

OPA Group 5

Refinery brass	5.00*

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*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

All S-type alloys (except 2S)	8.50
2S solids	8.00
High grade alloys	7.00
Low grade alloys	6.50
Borings and turnings	
High grade alloys	5.50
Low grade alloys	5.00

Plant scrap, mixed

All solids	6.00
Borings and turnings	4.00

Obsolete scrap

Pure cable	8.00
Old sheet and utensils	7.00
Old castings and forgings	6.50
Pistons, free of struts	6.50
Pistons, with struts	4.50
Old alloy sheet	5.50

For old castings and forgings, pistons, sheets, add ½c. lb. for lots 1000 to 19,999 lb.; for other scrap add 1c.; for lots over 19,999 lb. add 1½c. a lb.

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt	
Boring and turnings	8.00

Mixed, contaminated plant scrap

Grade 1 solids	11.00
Grade 1 borings and turnings	7.00
Grade 2 solids	9.00
Grade 2 borings and turnings	5.00

For lots over 1499 lb. add 1c. per lb.

Zinc

New zinc clippings, trimmings	7.25
Engravers' lithographers plates	7.25
Old zinc scrap	5.75
Unsweated zinc dross	5.80
Die cast slab	5.80
New die cast scrap	4.95
Radiator grilles, old and new	4.95
Old die cast scrap	4.50

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

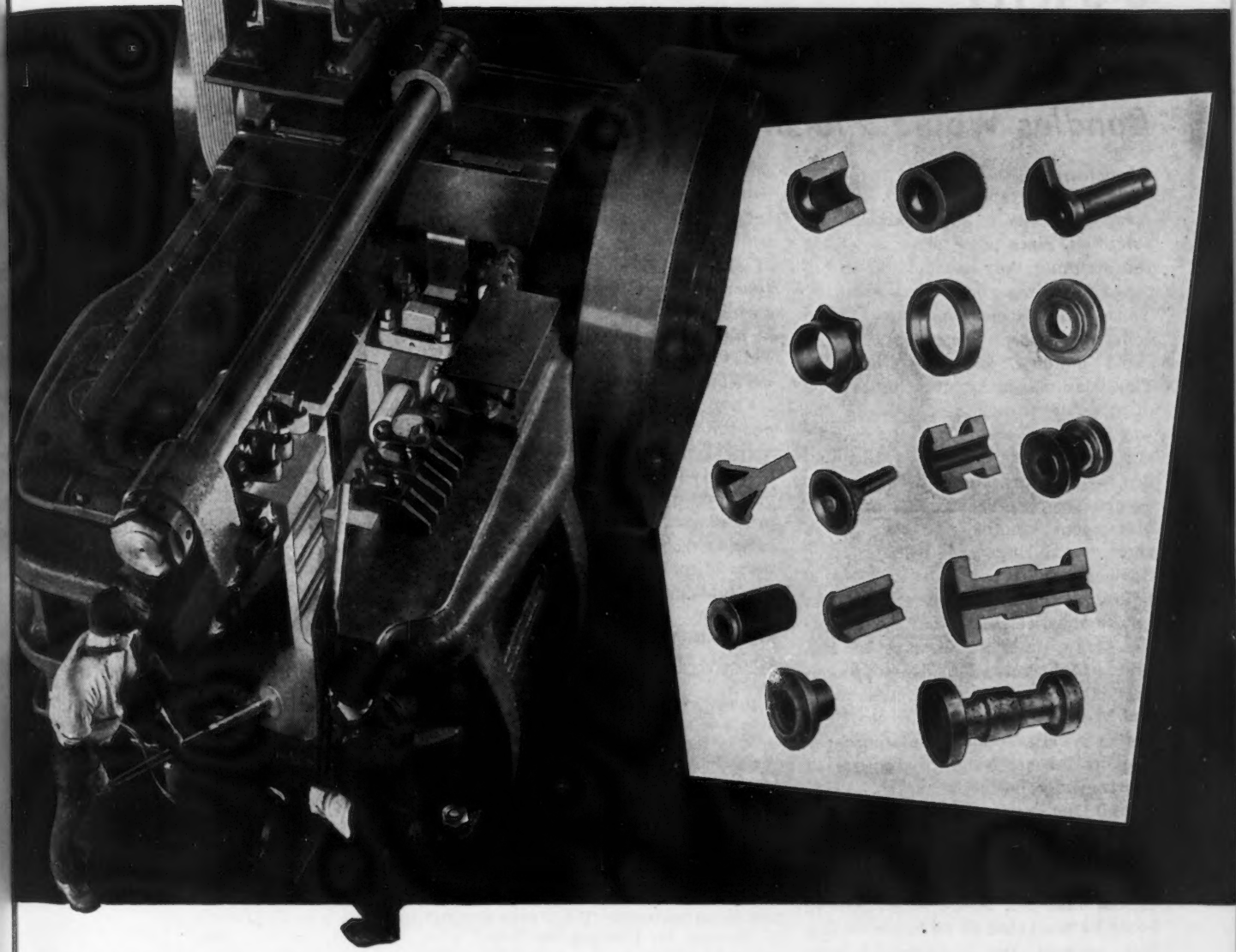
Copper: Cast, elliptical, 15 in. and longer	25⅛
Electrolytic, full size	22⅞
cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass: Cast, 82-20, elliptical, 15 in. and longer	23⅝
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00–13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots	40.82–41.125
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc, sulphate, 89% crystals, bbls.	6.80

FORGING AHEAD



★ In this period of unprecedented demand for forging production, much obsolete and inefficient forging equipment has, of necessity, been kept in operation to supplement the production of the modern machines in meeting the abnormal requirements.

In looking toward the future, when production for war will be a thing of the past and keen competition for peace time business will be paramount, we foresee the successful operators then as the ones who have equipped themselves with the most modern and highly efficient forging machinery and who have gained thorough experience in the high production operation of that machinery.

Ajax "Air Clutch" Forging Machines, built on the basis of mechanical soundness, provide the most advanced design of horizontal forging machines yet developed. These machines with their lower operating costs, higher production speeds and greater accuracy, so outstanding in the production of forgings for war now, will be invaluable in that era of forging ahead.

WRITE FOR BULLETIN No. 65-B

THE
AJAX
MANUFACTURING
COMPANY

EUCLID BRANCH P. O., CLEVELAND 17, OHIO
621 MARQUETTE BUILDING • CHICAGO 3, ILLINOIS

SCRAP

. . . News and Market Activities

Bundles Would Aid Market

Cleveland

• • • **Yards and mills** are slowing scrap purchases to match actual consumption. Since mills are wary of the war's timing they are holding inventories to immediate requirements. Yards are discouraging offers from collectors and producers in order to avoid building excessive inventory. This is an unhealthy situation in view of possible winter needs should the war in Europe continue. Neither dealers nor mills care to carry the burden of an inventory necessary to assure the winter supply and will blame one another in case of a shortage during the cold months. Some sources point out that No. 2 hydraulic bundles could be the best inflation protection for mills, and offer the scrap trade an impetus at this time. Light scrap suitable for bundling is reported plentiful and cheap and the cost of pressing is so slight that it is believed mills could purchase standby inventories of this grade at substantially reduced prices. This would lend uniformity to the scrap flow in those yards that have presses and enable the mills to build a winter backlog at a reduced cost. It is admitted that No. 2 hydraulic bundles could be marketed at $1 below ceiling and without the springboard with sufficient profit still remaining to encourage the yards. Far sighted purchasing agents who foresee full production of steel after the war may see in this idea a plan to buy scrap now, at post war prices.

A minimum of new buying is originating here. Blast furnace which had been moving is slowed by the dropping out of its main consumer in this area. Some small tonnages of blast furnace and open hearth are moving into the Valley. Low phos and alloys are stagnant. Buying is very selective. Yard inventories are low and are not being increased due to poor demand. Most shipments are on June orders and new orders are few. Buying has been on a 30 day contract basis with cancellations of unfilled tonnages being made at the expiration of the time limit. Scrap is not abundant but sufficient.

Despite the sluggishness of the market price cutting has not been prominent although the opportunity for it exists generally. The yards are offering less and less to producers and collectors as a means of discouraging the inflow of scrap to their yards while demand is so poor. Small-lots of machine shop turnings have been reported here to be selling without the springboard, and alloys can be bought at almost any offer the buyer makes. This trend is unimportant since the movement is of such small proportion.

Cast scrap for the first time in months is reported being refused by many foundries. At first this was believed due to an adequate supply but investigation shows that the present quality of cast scrap is far from being good No. 1, and as a minimum of machinery is being scrapped, the foundries prefer to use increased pig iron melts despite a slightly higher cost. Hence, the demand for good No. 1 remains as always.

•

PITTSBURGH — The scrap demand here has not changed to any great degree in the past few weeks, with demand for open hearth grades somewhat above supply. The turnings market is apparently fair, since there have been no known sales of carbon turnings at less than ceiling prices. While some quarters report that turnings have been sold in the area below ceiling prices, it is believed that these sales have been contaminated material. The steady demand in the east for turnings has helped keep prices at ceiling in this area.

•

BOSTON—The allotment of 3000 tons of low phos material to a New England consumer at $17.55 a ton Boston area shipping point leaves approximately an equal tonnage available in the open market, according to the trade. The 3000 tons allotment represents about 20 days' supply for the buyer. A Boston navy yard sale of 1000 tons of steel, mostly mixed, to a Pennsylvania mill through a broker at ceiling prices is reported. Some cast was moved to New England consumers the past week, but supply is entirely inadequate. Stove plate broken up small sold at $19 a ton.

•

BUFFALO—The district's leading consumer has resumed buying steel turnings at $13 a ton to meet the demand of continued heavy production. He had been reported offering only $12.50. This same consumer will again receive downlake shipments, after a lapse of several weeks. Freighters will bring heavy scrap from Chicago, Duluth and Detroit. Meanwhile, large barge fleets continue to unload at local mills and the total haul from the New York City area now stands at close to 60,000 tons this season. Yards continue to be hard-pressed to get out local scrap with short staffs of laborers, drivers and crane operators.

•

CINCINNATI—The district scrap market continues to be very quiet with consumers not interested in purchasing except good scrap, which in turn is not very plentiful. With the easing in demand for scrap there has been some pressure on prices, but so far dealers indicate that schedules are being observed, except in the heretofore reported instances of shipments out of the district. Consumers generally are trying to balance inventories against the war reports in an effort to keep supplies within reason.

•

BIRMINGHAM—Mills in this area are continuing to reduce inventories on all grades and are not paying ceiling prices at present for any material being offered. Very little scrap is being purchased and that is bought at from 50c. to $1.50 below ceiling per ton.

•

CHICAGO — Conditions in the scrap market here continue unchanged and rather dull. Demand for open hearth material remains steady and somewhat ahead of supply. Cast iron is still scarce. Markets for alloy scrap are almost invisible, and the lack of supply in dealer yards indicates that inventories are building up at producers. Shoveling turnings continue to move out of town at prices within $1 of ceiling while the market price continues at $2 under ceiling within Chicago, with very modest activity.

•

NEW YORK—Most eastern mills are buying moderately, if at all. Mills in eastern Pennsylvania are no longer buying cast metal scrap. Dealers are resentful about WPB allocations of scrap, which are mandatory for them but not for the mills. Pricing is an important factor in this dissatisfaction.

•

ST. LOUIS — Although the movement of scrap iron from the country continues light due to the shortage of labor to handle it, the inventories of mills are in better shape than at any time in the last two years. Granite City Steel Co. has released the last of the material it had embargoed because of the strike, except borings and turnings, which nobody wants.

•

PHILADELPHIA—Consumers in this district are out of the market for open hearth grades. The little that is being shipped is on old orders and no new commitments have been forthcoming. However, machine shop turnings and cast iron scrap are still in demand. Because of the shutting off by local mills, open hearth grades are moving out of this district on allocations, to nearby areas.

An Open Letter and Invitation to

Tool and Die Makers

Who Have Shop Problems

- Several years ago Kearney & Trecker began helping tool and die makers with their shop problems whenever they'd write in asking as to the best method of producing a particular tool or die. These requests for help included the making of plastic molds — forging, die casting, stamping, and drawing dies. In fact, they covered the whole tool and die field.

- In many cases our Model D Rotary Head Miller would handle the job to perfection — in other instances, after looking at the blueprints, we'd recommend some other method of producing the tool or die that was troubling them.

- Because of the extreme pressure which all of us were working under at that time, we didn't publicize the fact that such service was available. BUT . . . now we have set up facilities in our Tool and Die Department which will enable us to give you *prompt* advice without obligation, as to the fastest, cheapest way to do the job.

- If our Model D Rotary Head Miller is, in our judgment, the best bet for producing it — we'll tell you. In fact, we'll even make the job for you at a *very nominal cost* here in our own Tool and Die Department. What's more, we'd welcome having one of your men come to the plant to watch us make it.

- *If,* on the other hand, we feel that there's a better method of producing the tool or die — we'll return your blueprints with our recommendations. Fair enough?

If you're interested — write Tool and Die Division, Kearney & Trecker Products Corp., Milwaukee 14, Wis.

Kearney & Trecker Products
CORPORATION

Prices of Iron and Steel (Other Than Railroad) Scrap, Per Gross Ton

	BASIC OPEN HEARTH AND BLAST FURNACE GRADES							ELECTRIC FURNACE, ACID OPEN HEARTH, AND FOUNDRY GRADES										
								Low Phos.		Heavy Structural and Plate			Foundry Steel					
	No. 1 & 2 Heavy Melt. Steel; No. 1 Bushel; No. 1 & 2 Bdles.; Bundled Mach. Shop. Turn.	No. 3 Bundles	No. 2 Bushelings	Shoveling Turnings	Cast Iron Borings	Machine Shop Turnings; Mixed Borings and Turnings	Mill Scale	Billet, Bloom and Forge Crops	Bar Crops, Plate Scrap; Cast Steel; Punchings and Plate Scrap	3 ft. and Under	2 ft. and Under	1 ft. and Under	2 ft. and Under	1 ft. and Under	Springs and Crankshafts	Alloy Free Turnings	Heavy Turnings	Briquetted Cast Iron Borings	Electric Furnace Bundles
Pittsburgh, Brackenridge, Butler, Monessen, Midland, Johnstown, Sharon, Canton, Steubenville, Warren, Youngstown, Weirton	$20.00	$18.00	$17.50	$17.00	$16.00	$15.00	$12.00	$25.00	$22.50	$21.50	$22.00	$22.50	$21.50	$22.00	$21.00	$18.00	$19.50	$20.00	$21.00
Cleveland, Cincinnati, Middletown, Ashland, Portsmouth	19.50	17.50	17.00	16.50	15.50	14.50	11.50	24.50	22.00	21.00	21.50	22.00	21.00	21.50	20.50	17.50	19.00	19.50	20.50
Buffalo	19.25	17.25	16.75	16.25	15.25	14.25	11.25	24.25	21.75	20.75	21.25	21.75	20.75	21.25	20.25	17.25	18.75	19.25	20.25
Chicago, Claymont, Coatesville, Conshohocken, Harrisburg, Phoenixville, Sparrows Point	18.75	16.75	16.25	15.75	14.75	13.75	10.75	23.75	21.25	20.25	20.75	21.25	20.25	20.75	19.75	16.75	18.25	18.75	19.75
Bethlehem; Kokomo, Ind.	18.25	16.25	15.75	15.25	14.25	13.25	10.25	23.25	20.75	19.75	20.25	20.75	19.75	20.25	19.25	16.25	17.75	18.25	19.25
Duluth	18.00	16.00	15.50	15.00	14.00	13.00	10.00	23.00	20.50	19.50	20.00	20.50	19.50	20.00	19.00	16.00	17.50	18.00	19.00
Detroit	17.85	15.85	15.35	14.85	13.85	12.85	9.85	22.85	20.35	19.35	19.85	20.35	19.35	19.85	18.85	15.85	17.35	17.85	18.85
Toledo																			
St. Louis	17.50	15.50	15.00	14.50	13.50	12.50	9.50	22.50	20.00	19.00	19.50	20.00	19.00	19.50	18.50	15.50	17.00	17.50	18.50
Birmingham, Atlanta, Alabama City, (Ala.), Los Angeles, Pittsburg (Cal.), San Francisco	17.00	15.00	14.50	14.00	13.00	12.00	9.00	22.00	19.50	18.50	19.00	19.50	18.50	19.00	18.00	15.00	16.50	17.00	18.00
Minnequa, Colo.	16.50	14.50	14.00	13.50	12.50	11.50	8.50	21.50	19.00	18.00	18.50	19.00	18.00	18.50	17.50	14.50	16.00	16.50	17.50
Seattle, Wash.	14.50	12.50	12.00	11.50	10.50	9.50	6.50	19.50	17.00	16.00	16.50	17.00	15.00	16.50	15.50	12.50	14.00	14.50	15.50

SPECIAL GRADES: Briquetted Turnings up to 20 lb. with a density of not less than 60 per cent sell at the same price as Bundled Machine Shop Turnings. No. 1 and 2 Chemical Borings have a ceiling price of $1 and $2, respectively, less than No. 1 Heavy Melting Steel when sold for use for chemical or annealing purposes. Otherwise, the price shall not exceed that of cast iron borings. Sellers may charge additional 75c. for loading in box cars or gondolas with weatherproof covering. Tin Can Bundles are $4 less than No. 2 Bundles. Welding Rod Butts are $3.50 per ton less than No. 1 Heavy Melting Steel. Wrought Iron is $6.50 per ton more than No. 1 Heavy Melting, when sold to a producer of wrought iron. Otherwise, maximum shall not exceed prices for corresponding basic open hearth or blast furnace grade. Shafting is $7.00 per ton higher than No. 1 Heavy Melting. This includes random length shafting suitable without further preparation for rerolling or forging.

Price of Pit Scrap, ladle scrap, salamander scrap, skulls, skimmings, or scrap recovered from slag dumps and prepared to charging box size shall be computed by deducting from No. 1 Heavy Melting Steel Scrap prices the following amounts: Fe content, 85 per cent and over, $2; 75 per cent and over, $4; less than 75 per cent, $8.

Grindings or mill cinders (except cast iron grindings with Fe content 85 per cent and over when sold for chemical use) shall be $4 per ton at any shipping point.

MAXIMUM SHIPPING POINT PRICE: Where shipment is wholly or partially by rail or vessel, or combination of rail and vessel, the scrap is at shipping point when placed f.o.b. railroad or f.a.s. vessel. For motor vehicle shipments scrap is at shipping point when loaded. Then maximum shipping point price shall be: (a) For shipping point located within a basing point, prices shown in above table for scrap at basing point in which shipping point is located, minus applicable switching charge deduction shown in paragraph labeled **Switching Charges.** (b) For shipping points outside basing point, price listed in above table for scrap at most favorable basing point, minus lowest charge for transportation from shipping point to such basing point by rail or water carrier or combination. When vessel movement is involved, in lieu of established dock charge or any cost customarily incurred at the dock, 75c. per ton must be included as part of deduction in computing shipping point price; 50c. at Memphis; $1 at Great Lakes ports; and $1.25 at New England ports. If no established transportation rate exists for a portion of movement from shipping to basing point, actual charge or cost customarily incurred by shipper in such portion of movement shall be included as part of deduction in computing shipping point price. For exceptions see official order.

SWITCHING CHARGES: Deductions to determine the maximum shipping point prices for scrap originating in basing points are as follows (cents per gross ton): Chicago, 84c.; Pittsburgh, Brackenridge, 55c.; Detroit, 53c.; Cleveland, Johnstown, Sharon, Warren, Weirton, Youngstown, Midland, Los Angeles, San Francisco, Pittsburg (Cal.), 42c.; Seattle, 38c.; Buffalo, Claymont, 36c.; Atlanta, Birmingham, 32c.; Ashland, Bethlehem, Butler, Canton, Cincinnati*, Coatesville, Duluth, Harrisburg, Kokomo, Monessen, Phoenixville, Portsmouth, St. Louis, Steubenville, 28c.; Alabama City, 26c.; Minnequa, 22c.; Middletown, 14c.; Conshohocken, Sparrows Point, 11c.

* For basic open hearth, blast furnace, and foundry grades, the switching charge deduction shall be 80c. per gross ton.

UNPREPARED SCRAP: For unprepared scrap except bundle scrap, maximum prices shall be $3.50 per gross ton less than price of No. 1 heavy melting. That unprepared which when compressed constitutes a No. 1, 2, or 3 bundles shall be $4.00 less than price for those prepared grades. Unprepared from which Tin Can Bundles is constituted shall be $3.50 less than that prepared grade. Preparation-in-transit charges for such work are provided for in the order. Maximum fees for in-transit preparation of scrap that is allocated to a consumer by WPB are shown in the order, as well as exceptions.

ALLOY CONTENT: Premiums are allowed for specific alloy contents for the following alloys: Nickel—$1 for each 0.25 per cent for 1 to 5.25 per cent ni.; Molybdenum—$2 for not less than 0.15 per cent and $3 for not less than 0.65 per cent mo.; Manganese—$3 over No. 1 heavy melting steel price for not less than 10 per cent if scrap is in sizes larger than 12x24x8-in. $7 over No. 1 price when not less than 10 per cent mn. and cut to sizes of 12x48x8-in. or smaller. These mn. premiums applicable only if scrap is sold for electric furnace use. Chromium—$1 if scrap conforms to SAE 52100 and sold for electric furnace use. Multiple Alloys—Where scrap contains two premium alloys, premium charged may not exceed maximum premium for any one contained alloy.

Tool Steel Scrap Prices (MPR 379)

SEGREGATED	Solids Per Lb. Cont. W	Turnings Per Lb. Cont. W
Type 1. 12% min. W, 1% max. Mo	$1.80	$1.60
Type 2. 5 to 12% W, 1% max. Mo	1.60	1.40
Type 3. 1 to 5% W, 1.5% max. Mo	1.25	1.25
*Type 4. 7% min. Mo, 2% max. W	0.125	0.105
*Type 5. 3.5 to 6% Mo, 4.5 to 6% W	0.135	0.115

*Per lb. of scrap material.

UNSEGREGATED SOLIDS	UNSEGREGATED TURNINGS
$1.50 per lb. contained W if 5% or more.	$1.30 per lb. contained W if 5% or more.
$1.15 per lb. contained W if 1 to 5%.	$1.00 per lb. contained W if 1 to 5%.
$0.80 per lb. contained Mo if 1.5% or more.	$0.70 per lb. contained Mo if 1.5% or more.

If both W and Mo are within ranges, payment may be made for both W and Mo content.

If segregated, a premium of $1.50 per lb. of contained Co allowed if Co content is 3% or over. No scrap considered segregated if Co content ranges between 0.5 and 3%. If Cu or Ni content over 0.25%, price shall be reduced by 50%. If 500 lb. or less is sold, either segregated or unsegregated, price shall be reduced 2c. per lb. of scrap material.

Cast Iron Scrap Price, Per Gross Ton

The maximum shipping point, or on-line price in the case of railroad sellers, price per gross ton for cast iron scrap shall be the price shown in the accompanying table for the zone in which the scrap is located. For railroad sellers the maximum on-line price shall be the price shown in the table for the highest priced zone in which the railroad operates.

Grades	Zone A	Zone B	Zone C
Cast Iron No. 1 (cupola cast)	$18.00	$19.00	$20.00
Cast Iron No. 2 (charging box cast)	17.00	18.00	19.00
Cast Iron No. 3 (heavy breakable cast)	14.50	15.50	16.50
Cast Iron No. 4 (burnt cast)	13.25	14.25	15.25
Cast Iron Brake Shoes	13.25	14.25	15.25
Stove Plate	17.00	18.00	19.00
Clean Auto Cast	18.00	19.00	20.00
Unstripped Motor Blocks	15.50	16.50	17.50
Wheels No. 1	18.00	19.00	20.00
Malleable	20.00	21.00	22.00

Zone A includes Mont., Idaho, Wyo., Nev., Utah, Ariz., and N. M. Zone B includes N. D., S. D., Neb., Colo., Kan., Okla., Texas, and Fla. Zone C includes all states not named in zones A and B, and includes switching district of Kansas City, Kansas-Missouri.

DELIVERED PRICE: For any cast grade, the delivered price shall be the shipping point price plus established charges for transportation from shipping point to point of delivery by means of transportation employed. If delivery involves water movement, dock charges incurred may be added. On privately owned docks, specified charges are listed in the order. For scrap of railroad origin, the delivered price shall be the maximum on-line price plus transportation charges allowable to railroad sellers of steel scrap. For truck deliveries, shipping point or on-line prices plus established public carrier charges, except when truck is shipper-owned, shall determine price. When truck is shipper or broker-owned, price is that shown in table plus the highest established rail carload freight rate for shipping scrap from rail siding nearest shipping point to rail siding nearest point of delivery. Springboard limitations shall be applicable to truck deliveries of all non-operating railroad or dealer and industrial scrap. Where truck delivery charges in excess of $1 occur, they must be certified by OPA.

These small precision timing devices made by Pollak for shells and bombs operate with unfailing accuracy and deadly effect on our foes.

THE "BRAINS" of a shell or bomb is the fuze. It can be set for detonation on contact with or above the target, or for delayed action. It is the essential control for the destruction of our enemies by artillery or bombing.

Pollak has turned them out by the million and they are in action on every front and in every battle. Each one is truly the little fuze with a Big Mission. Each one accurate—efficient—deadly.

Pollak Facilities for War Will Be At Your Service for Peace

Some day, when peace is won and our own war work is finished the proven ability of Pollak to engineer, develop and manufacture products which, like these fuzes, are designed right and made right—produced in volume—and delivered on time—may be of great value in your business.

It Is Not Too Early to Ask for Designs and Proposals for Pollak

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We have an experienced staff of development engineers who will be glad to assist you in planning details of design and development and carrying through to production specifications.

Pollak has always been one of the largest fabricators of the less common metals. We are specialists in Blanking, Stamping, Drawing, Spinning and Welding of Monel, Inconel, Aluminum and Magnesium.

Here also you will find large facilities for production in Multiple Spindle Automatic Screw Machine, Lathe, Milling Machine and Drill Press Work, as well as Electrical Coil Windings.

May we suggest that now, while you are planning for peacetime products you let us plan with you. We will meet with you and your engineers at your convenience.

POLLAK PRECISION PRODUCTS

Buy More Bonds Than Before

The original Army-Navy "E" award to this company has been renewed four times. Each of the four stars on this flag symbolizes six months of exacting service to our Armed Forces.

POLLAK MANUFACTURING COMPANY · ARLINGTON, NEW JERSEY

DEVELOPING · DESIGNING · MACHINE WORK · SPINNING · WELDING · STAMPING · FINISHING

Comparison of Prices . . .

Advances Over Past Week in Heavy Type; Declines in *Italics*. [Prices Are F.O.B. Major Basing Points]

Flat Rolled Steel: (Cents Per Lb.)	July 18, 1944	July 11, 1944	June 13, 1944	July 20, 1943
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	July 18, 1944	July 11, 1944	June 13, 1944	July 20, 1943
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$25.89
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	25.11	25.11	25.11	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	31.34
Ferromanganese‡	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh.	$20.00	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	18.75	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	17.85	17.85	17.85	17.85
Low phos. plate, Youngs'n	22.50	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Ch'go	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.00	$7.00	$7.00	$6.50
Foundry coke, prompt	8.25	8.25	8.25	7.50
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd.	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony (Asiatic), N. Y.	16.50	16.50	16.50	16.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 164-173.

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
July 18, 1944	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One week ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.26190c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	HIGH	LOW	HIGH	LOW	HIGH	LOW
1943	2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 8
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

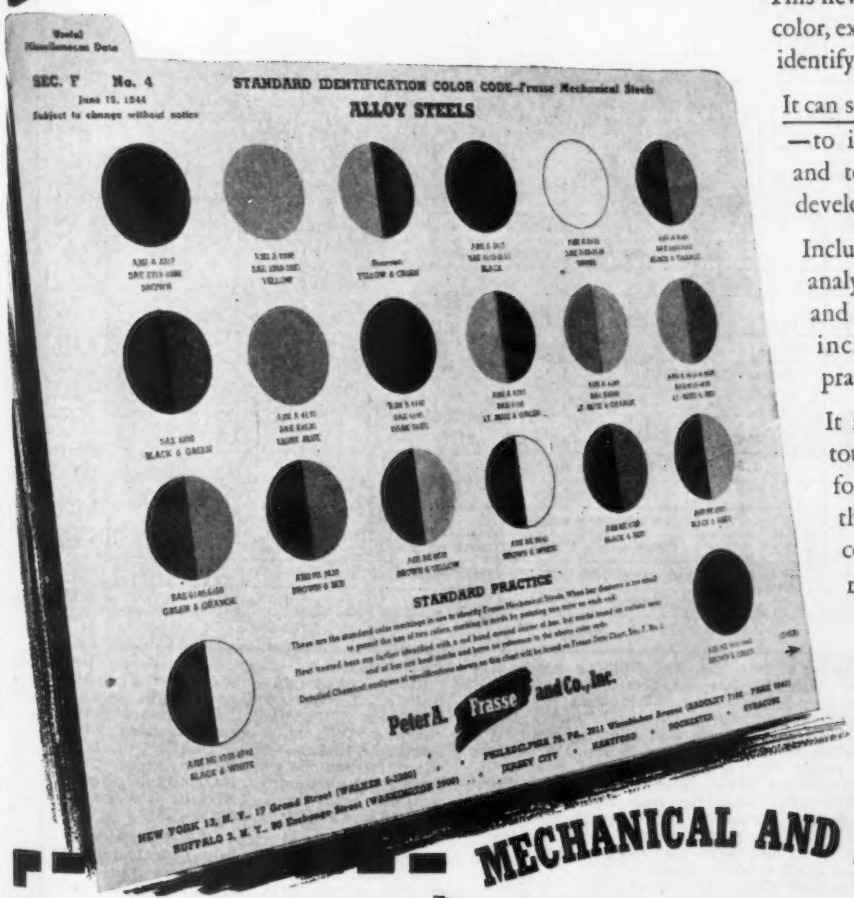
Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

New STANDARD COLOR CODE for STEEL IDENTIFICATION

Latest Frasse Data Chart Explains Standard Practice


SEC. F No. 4
June 15, 1944
Subject to change without notice
STANDARD IDENTIFICATION COLOR CODE—Frasse Mechanical Steels
ALLOY STEELS
STANDARD PRACTICE
Peter A. Frasse and Co., Inc.
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This new Frasse Data Chart, printed in full color, explains the standard color code used to identify Frasse mechanical and aircraft steels.

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MECHANICAL AND AIRCRAFT STEELS

9

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Grand Street at Sixth Avenue
New York 13, N. Y.

Please send me a copy of your latest Frasse Data Chart, Section F, No. 4, showing the Frasse standard color code for steel identification.

NAME_____

FIRM_____ ADDRESS_____

SEAMLESS MECHANICAL AND AIRCRAFT TUBING · COLD FINISHED BARS · DRILL ROD · AIRCRAFT STEELS
STAINLESS STEELS AND TUBING · ALLOY STEELS · COLD ROLLED STRIP AND SHEETS · WELDED STEEL TUBING

. . . Prices of Finished Iron and Steel

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per lb. under base; primes 25c. above base. (2) Unassorted 8-lb. coating. (3) Widths up to 12-in. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (12) Boxed. (13) Portland and Seattle price, San Francisco 2.50c. (14) This base price for annealed, bright finish wires, commercial spring wire.

Basing Point → / Product ↓	Pittsburgh	Chicago	Gary	Cleveland	Birmingham	Buffalo	Youngstown	Sparrows Point	Granite City	Middletown, Ohio	Gulf Ports, Cars	Provo, Utah	10 Pacific Ports, Cars	DELIVERED TO Detroit	New York	Philadelphia
Hot Rolled Sheets	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢			2.65¢	2.20¢	2.34¢	2.27¢
Cold Rolled Sheets[1]	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢			3.70¢	3.15¢	3.39¢	3.37¢
Galv. Sheets (24 gage)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢			4.05¢		3.74¢	3.67¢
Enameling Sheets (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢			4.00¢	3.45¢	3.71¢	3.67¢
Long Ternes[2]	3.80¢	3.80¢	3.80¢										4.55¢		4.16¢	4.12¢
Hot Rolled Strip[3]	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢			2.75¢	2.20¢	2.46¢	
Cold Rolled Strip[4]	2.80¢	2.90¢		2.80¢			2.80¢	(Worcester = 3.00¢)						2.90¢	3.16¢	
Cooperage Stock Strip	2.20¢	2.30¢			2.20¢		2.20¢								2.56¢	
Commodity C-R Strip	2.95¢	3.05¢		2.95¢			2.95¢	(Worcester = 3.35¢)						3.05¢	3.31¢	
Coke Tin Plate, Base Box	$5.00	$5.00	$5.00						$5.10						5.36¢	5.32¢
.50 Electro Tin Plate, Box	$4.50	$4.50	$4.50						$4.60							
.75 Electro Tin Plate, Box	$4.65		$4.65						$4.75							
Black Plate (29 gage)[5]	3.05¢	3.05¢	3.05¢						3.15¢				4.05¢[13]			3 37¢
Mfg. Ternes, Special Box	$4.30	$4.30	$4.30						$4.40							
Carbon Steel Bars	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		(Duluth = 2.25¢)			2.50¢		2.80¢	2.25¢	2. 49¢	2.47¢
Rail Steel Bars[6]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢					2.50¢		2.80¢			
Reinforcing (Billet) Bars[7]	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢		2.55¢[13]	2.25¢	2.39¢	
Reinforcing (Rail) Bars[7]	2.15¢	2.15¢	2.15¢	2 15¢	2.15¢	2.15¢	2.15¢				2.50¢		c2.55¢[13]	2.25¢		2.47¢
Cold Finished Bars[8]	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢		(Detroit = 2.70¢)			(Toledo = 2.80¢)				2.99¢	2.97¢
Alloy Bars, Hot Rolled	2.70¢	2.70¢				2.70¢	(Bethlehem, Massillon, Canton = 2.70¢)							2.80¢		
Alloy Bars, Cold Drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢								3.45¢		
Carbon Steel Plates	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢	(Coatesville and Claymont = 2.10¢) 2.10¢	2.35¢		2.45¢	2.60¢	2.65¢	2.32¢	2.29¢	2.15¢
Floor Plates	3.35¢	3.35¢									3.70¢		4.00¢		3.71¢	3.67¢
Alloy Plates	3.50¢	3.50¢			(Coatesville = 3.50¢)						3.95		4 15¢		3.70¢	3.59¢
Structural Shapes	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢		(Bethlehem = 2.10¢)			2.45¢		2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R 0.26 to 0.50 Carbon	2.80¢			2.80¢			(Worcester = 3.00¢)									
0.51 to 0.75 Carbon	4.30¢			4.30¢			(Worcester = 4.50¢)									
0.76 to 1.00 Carbon	6.15¢			6.15¢			(Worcester = 6.35¢)									
1.01 to 1.25 Carbon	8.35¢			8.35¢			(Worcester = 8.55¢)									
Bright Wire[14]	2.60¢	2.60¢		2.60¢	2.60¢		(Worcester = 2.70¢)		(Duluth = 2.65¢)				3.10¢			2.92¢
Galvanized Wire	Add proper size extra and galvanizing extra to Bright Wire base.															
Spring (High Carbon)	3.20¢	3.20¢		3.20¢			(Worcester = 3.30¢)						3.70¢			3.52¢
Steel Sheet Piling	2.40¢	2.40¢				2.40¢							2.95¢			2.72¢

EXCEPTIONS TO PRICE SCHED. NO. 6

Slabs—Andrews Steel Co. $41 basing pts.; Wheeling Steel Corp. $34 Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. $41; Phoenix Iron Co. (rerolling) $41, (forging) $47; Granite City Steel Co. $47.50.

Blooms—Phoenix Iron Co. (rerolling) $41, (forging) $47.

Sheet Bar—Empire Sheet & Tin Plate Co. $39 mill; Wheeling Steel Corp. $38 Portsmouth, Ohio.

Billets, Forging—Andrews Steel Co. $50 basing pts.; Follansbee Steel Corp. $49.50 Toronto; Phoenix Iron Co. $47.00 mill. Geneva Steel Co. $64.64 f.o.b. Pacific Coast Ports.

Billets, Rerolling—Continental Steel Corp. may charge Acme Steel in Chicago switching area $34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) $41 mill; Wheeling Steel Corp. (small) $36 Portsmouth, Ohio; (blooming mill sizes) applicable base, f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at $39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. $41 mill; Continental Steel Corp. (1¾ x 1¾) $39.50, (2 x 2) $40.60 Kokomo, Ind. (these prices include $1 size extra); Keystone Steel & Wire Co. $36.40 Peoria; Connors Steel Co. $50.69 Birmingham; Ford Motor Co. $34 Dearborn, Mich. Geneva Steel Co. $58.64 f.o.b. Pacific Coast ports.

Structural Shapes—Phoenix Iron Co. $2.35 basing pts. (export) $2.50 Phoenixville; Knoxville Iron Co. $2.30 basing points.

Bar Size Shapes—(Angles) W. Ames & Co., 10 tons or over, $3.10 mill.

Rails—Sweet Steel Co. (rail steel) $50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp., $45 Pueblo.

Hot Rolled Plate—Granite City Steel Co. $2.65 mill; Knoxville Iron Co. $2.25 basing pts.; Kaiser Co. and Geneva Steel Co. $3.20 Pacific Ports; Central Iron & Steel Co. $2.50 basing points; Granite City Steel Co. $2.35 Granite City.

Merchant Bars—W. Ames Co., 10 tons and over, $2.85 mill; Eckels-Nye Steel Corp., $2.50 basing pts. (rail steel) $2.40; Phoenix Iron Co. $2.40 basing pts.; Sweet Steel Co. (rail steel) $2.35 mill; Joslyn Mfg. & Supply Co., $2.35 Chicago; Calumet Steel Dic., Borg Warner Corp. (8 in. mill bars) $2.35 Chicago; Knoxville Iron Co. $2.30 basing pts. Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill. Milton Mfg. Co. $2.75 f.o.b. Milton, Pa.

Logan Iron and Steel Co., Burnham, Pa., wrought iron bars, Grade I, $7.90 per 100 lb. f.o.b. plant. Ceiling is $7.40 per 100 lb.

Reinforcing Bars—W. Ames & Co., 10 tons and over, $2.85 mill; Sweet Steel Co. (rail steel) $2.35 mill; Columbia Steel Co. $2.50 Pacific Ports.

Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Massfield, Mass., f.o.b. Massfield; Empire Finished Steel Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight ville; Medart Co. in certain areas, Chi- Buffalo to Readville, Mass. f.o.b. Readcago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.

Alloy Bars—Texas Steel Co. for delivery except Texas and Okla. Chicago base, f.o.b. Fort Worth, Tex.; Connors Steel Co. shipped outside Ala., Mississippi, Louisiana. Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.

Hot Rolled Strip—Joslyn Mfg. & Supply Co. $2.30 Chicago; Knoxville Iron Co. $2.25 basing pts.

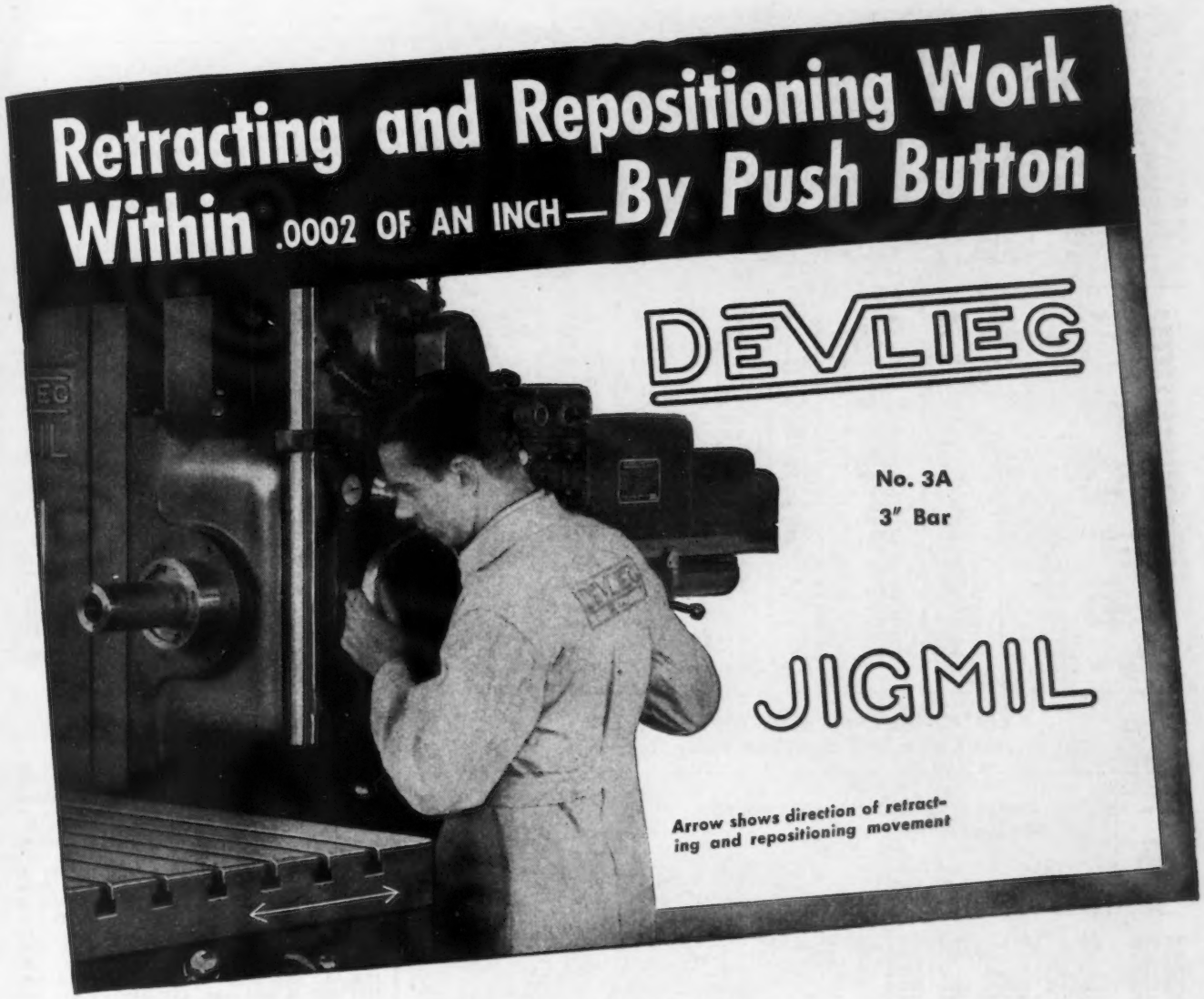
Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., $2.25 Parkersburg.

Galvanized Sheets—Andrews Steel Co., $3.75 basing pts.; Parkersburg Iron & Steel Co. $3.85 Parkersburg; Apollo Steel Co. $3.75 basing pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.

Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.

Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is $2.45 per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

Retracting and Repositioning Work Within .0002 OF AN INCH—By Push Button



The most frequently needed function in a precision boring machine is that of retracting the work to facilitate measuring and tool setting.

In the DeVlieg Jigmil, this function is automatic—by fingertip control. Operation of a push button unlocks the table and moves it by rapid traverse to the desired position for measuring. For repositioning, operation of a single push button will cause the table to return to its cutting position by rapid traverse, stopping and locking automatically. Uniformity of selected position for stopping and locking is dependable within .0002".

The DeVlieg Jigmil is a new type machine—has the spacing accuracy of a Jig Borer — Performance Qualities of a Milling Machine—Convenience and Flexibility of a Horizontal Boring Mill. All control is so centered and organized that the operator never has to take his eyes off the work.

Thus, the Jigmil fulfills the machine tool ideal—a powerful and accurate extension of the operator's hand.

Many machines show 75 per cent greater average daily productivity.

DE VLIEG MACHINE COMPANY

450 FAIR AVE. FERNDALE (DETROIT) MICHIGAN

Write for Circular

DEVLIEG MACHINE TOOLS

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendments to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-45 Ann.
**Philadelphia	3.518	4.872[8]	5.018[a]	3.922	4.772	3.605	3.666	3.822	4.072	5.966	7.066	7.272	8.322
New York	3.590	4.613[3]	5.010	3.974[6]	4.772	3.768	3.758	3.853	4.103	6.008	7.108	7.303	8.353
Boston	3.744	4.744[9]	5.224[9]	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.759	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.65[17]	3.55	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.387	4.337[3]	5.272[4]	3.737	4.787[17]	3.687	3.687	3.637	3.887	5.987	7.087	7.087	8.137
Cleveland	3.35	4.40	4.877[4]	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.754	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.004	3.70	4.659[17]	3.609	3.661	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.475[3]	4.825[5]	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.347[3]	5.172[4]	3.747	4.931[17]	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.46	5.257[4]	3.86	4.35[17]	3.81[13]	3.81[13]	3.76[13]	4.361	6.09	7.19	7.561	8.711
Omaha	3.865	5.443	5.608[4]	4.215	....	4.165	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.58	3.98	6.08	7.18	7.18	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.965[7]	4.68	3.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	4.95	5.358	4.308	....	4.158	4.158*	4.108*	4.629	....	....	....	....
Houston	3.763	5.573	6.313[1]	4.313	....	4.25	4.25	3.75	6.373[3]	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20[3]	6.10[4]	4.95	5.613[15]	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.55[14]	7.30[4]	6.35[4]	4.50[14]	7.333[17]	4.65[14]	4.35[14]	4.15[14]	5.333	8.304	9.404	9.404	10.454
Seattle	4.65[12]	7.05[4]	5.95[4]	4.25[12]	....	4.75[12]	4.45[12]	4.35[12]	5.783	....	9.404	....	....
Portland	4.65[11]	6.60[4]	5.75[4]	4.75[11]	....	4.75[11]	4.45[11]	4.45[11]	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.53[17]	....	6.17[18]	5.53[17]	....	4.98[17]	4.98[17]	4.88[17]	5.90	....	....	....	....

NATIONAL EMERGENCY (N. E.) STEELS
(Hot Rolled Mill Extras for Alloy Content)

Designation	CHEMICAL COMPOSITION LIMITS, PER CENT								Basic Open-Hearth		Electric Furnace	
	Carbon	Manganese	Phosphorus Max.	Sulphur Max.	Silicon	Chromium	Nickel	Molybdenum	Bars and Bar-Strip	Billets, Blooms and Slabs	Bars and Bar-Strip	Billets, Blooms and Slabs
NE 1330	.28/ .33	1.60/1.90	.040	.040	.20/ .35				.10c	$2.00		
NE 1335	.33/ .38	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1340	.38/ .43	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1345	.43/ .48	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 1350	.48/ .53	1.60/1.90	.040	.040	.20/ .35				.10	2.00		
NE 8613	.12/ .17	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25c	$25.00
NE 8615	.13/ .18	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8617	.15/ .20	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8620	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8630	.28/ .33	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8635	.33/ .38	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8637	.35/ .40	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8640	.38/ .43	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8642	.40/ .45	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8645	.43/ .48	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8650	.48/ .53	.75/1.00	.040	.040	.20/ .35	.40/ .60	.40/ .70	.15/ .25	.75	15.00	1.25	25.00
NE 8720	.18/ .23	.70/ .90	.040	.040	.20/ .35	.40/ .60	.40/ .70	.20/ .30	.80	16.00	1.30	26.00
NE 9255	.50/ .60	.70/ .95	.040	.040	1.80/2.20				.40	8.00		
NE 9260	.55/ .65	.70/1.00	.040	.040	1.80/2.20				.40	8.00		
NE 9261	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.10/ .25			.65	13.00		
NE 9262	.55/ .65	.70/1.00	.040	.040	1.80/2.20	.25/ .40			.65	13.00		
NE 9415	.13/ .18	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9420	.18/ .23	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9422	.20/ .25	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9425	.23/ .28	.80/1.10	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9430	.28/ .33	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9435	.33/ .38	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9437	.35/ .40	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9440	.38/ .43	.90/1.20	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.75	15.00	1.25	25.00
NE 9442	.40/ .45	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9445	.43/ .48	1.00/1.30	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9450	.48/ .53	1.20/1.50	.040	.040	.20/ .35	.30/ .50	.30/ .60	.08/ .15	.80	16.00	1.30	26.00
NE 9537*	.35/ .40	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9540*	.38/ .43	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9542*	.40/ .45	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9545*	.43/ .48	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00
NE 9550*	.48/ .53	1.20/1.50	.040	.040	.40/ .60	.40/ .60	.40/ .70	.15/ .25	1.20	24.00	1.70	34.00

*Recommended for large sections only. Note: The extras shown are in addition to a base price of 2.70c. per 100 lb., on finished products and $54 per gross ton on semi-finished steel major basing points and are in cents per 100 lb. and dollars per gross ton in semi-finished. When acid open-hearth is specified and acceptable add to basic open hearth alloy differential 0.25c. per lb. for bars and bar strip, $5.00 per gross ton for billets, blooms and slabs. The ranges shown above are restricted to sizes 100 sq. in. or less or equivalent cross sectional area 18 in. wide or under with a max. individual piece weight of 7000 lb.

Base Quantities

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(a) Philadelphia: Galvanized sheets, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports)**

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF_2 Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00
Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast Ports; Empire Sheet & Tinplate Co., $34.25.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00
Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00
Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Provo, $11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton 54.00
Price delivered Detroit $2.00 higher; E. Michigan $3.00 higher.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.
Prices delivered Detroit are $2.00 higher; E. Michigan, $3 higher.
Price Exception: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.
Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(*No. 5 to 9/32 in.*)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

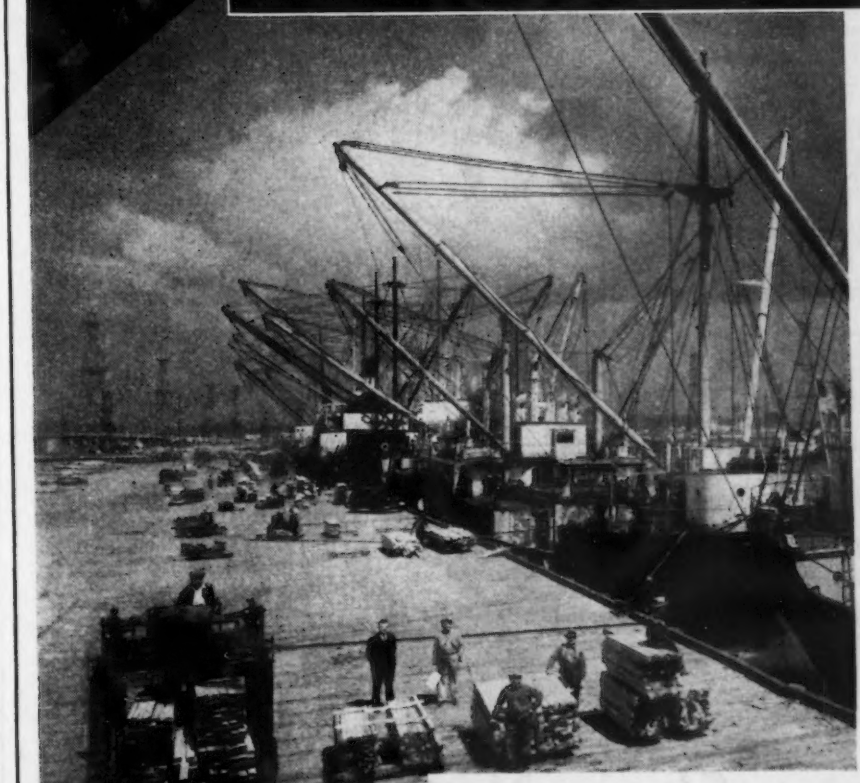
TOOL STEEL

(*F.o.b. Pittsburgh, Bethlehem, Syracuse*)

	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

The ROSS CARRIER —An Economy-Link in Marine Shipping



Warehouse, yard, dock — all are economically linked by the Ross Carrier and its unit-load handling system. Wherever materials and cargoes can be transported in units or "packages" — Ross Carriers and Lift Trucks can handle them faster and at minimum cost . . . Keep materials moving. Write for Bulletin I-74.

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FIRST PRIZE for speeding production goes to SPEEDI-DRI—the quick-acting oil- and grease-absorbent that puts a sure, slip-proof footing under employees who have to work around machines that drip oil and grease onto the floor. Sure-footed workers move faster when the danger of slipping is eliminated by SPEEDI-DRI. Application of this light-reflecting, granular material will not only absorb the daily oil deposits but will soon draw the old accumulations of oil and grease from the floors. SPEEDI-DRI also retards fire, saves shoes from oil-rot, helps prevent industrial skin-diseases, reduces porter-labor, improves morale, brightens the plant, cuts insurance costs. Write for literature and FREE SAMPLE.

SUPPLIERS: East—Refiners Lubricating Co., New York 1, New York.
Midwest & South—Waverly Petroleum Products Co., Philadelphia 6, Pa.
West Coast—Waverly Petroleum Products Co., Russ Bldg., San Francisco 4, Calif.

SPEEDI-DRI
OIL AND GREASE ABSORBENT

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills
(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$200.00 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron (Same as Above)		
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.20
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.20

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	*Seamless Hot Rolled*	*Lap Weld, Hot Rolled*
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.58
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	Pacific Coast Basing Points†
	Base per Keg	
Standard wire nails	$2.55	$3.05
Coated nails	2.55	3.05
Cut nails, carloads	3.85	....
	Base per 100 Lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	$0.67	$0.85
Fence posts, carloads	.69	.86
Single loop bale ties	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbless wire	.70	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.
†Prices subject to switching or transportation charges.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:
Base discount less case lots

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1¼ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:
(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. to 1 in.	59	..
1¼ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts	*Consumer*
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets
(½ in. and larger)

	Base per 100 lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets
(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws	*Consumer Per Cent Off List*
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

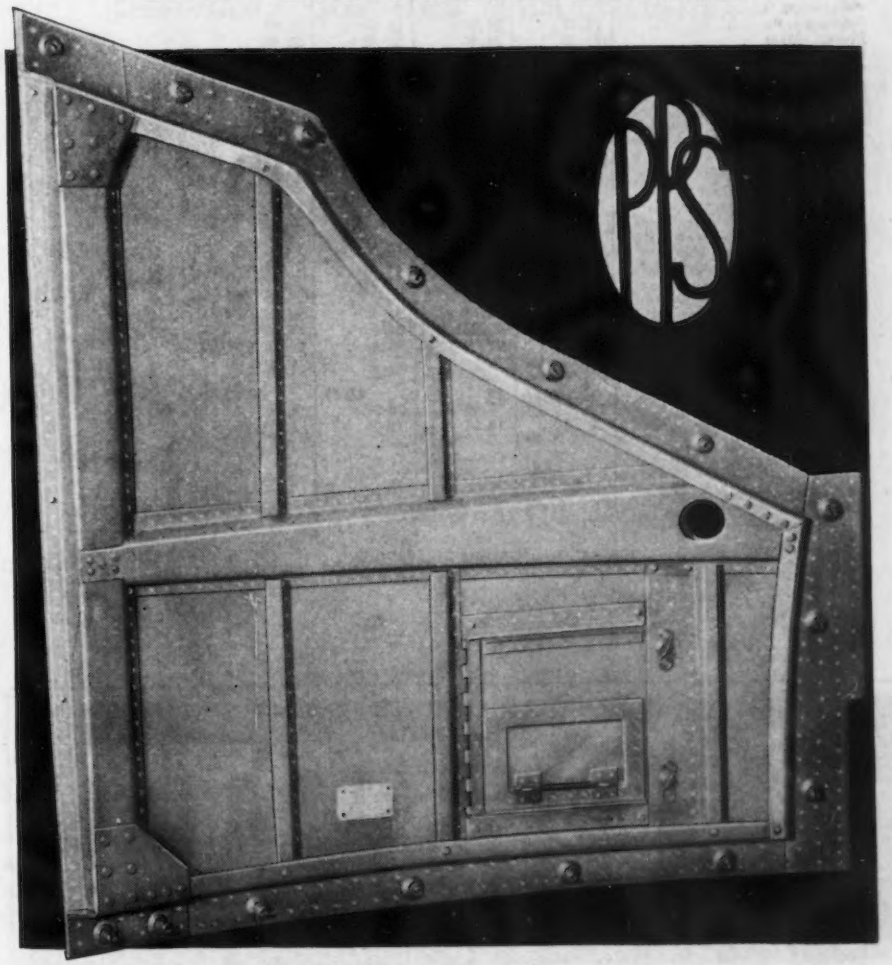
Freight allowed up to 65c per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00

Parish-fabricated in aluminum



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PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phos-phorus	Charcoal
Boston	*$25.50*	*$25.00*	*$26.50*	*$26.00*	.....	.....
Brooklyn	*27.50*	*27.00*		*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*		.....
Philadelphia (4)	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	25.00	24.50	26.00	25.50	.....	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50		.....
Steelton, Pa.		24.50			29.50	.....
Birdsboro, Pa. (3)	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50			.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa. (1)	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati, Ohio	*25.11*	*24.61*	.....	*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.69*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	.....*$37.34*
Granite City, Ill.	24.00	23.50	24.50	24.00		.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50		24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	34.00
Lyles, Tenn. fc. (2)	.....	.....	.....	.....	.....	33.00
St. Paul	*26.63*	26.13	*27.13*	*26.63*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	.....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	.....	.....	.....	.....	.....
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

(1) Pittsburgh Coke & Iron Co (Sharpsville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron and Steel Co. may add another $1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorous iron; high phosphorous sells for $28.50 at the furnace.

(3) E. & G. Brooke Co. Birdsboro, Pa. permitted to charge $1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21⅛ to 23½c
Copper, reduced, 150 and 200 mesh	20½ to 25½c
Iron, commercial, 100 and 200 mesh, 96 + % Fe	13½ to 15c
Iron, crushed, 200 mesh and finer, 90 + % Fe	4c
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe	63c
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33c
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42c
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90c
Aluminum, 100 and 200 mesh	*23 to 27c
Antimony, 100 mesh	20.6c
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh, 11½ to 12½c	
Manganese, 150 mesh	51c
Nickel, 150 mesh	51½c
Solder powder, 100 mesh, 8½c. plus metal	
Tin, 100 mesh	58¾c
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum power, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

COKE

Furnace, beehive (f.o.b. oven)	Net Ton
Connellsville, Pa.	$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.25
Foundry, By-Product	
Chicago, del'd	13.35
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.85
Birmingham, del'd	10.50

*Hand drawn ovens using trucked coa permitted to charge $7.75 per ton plus transportation charges. **Mo., Ala., and Tenn. producers—$13.35.

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PRICES

REFRACTORIES
(F.o.b. Works)

	Per 1000
Fire Clay Brick	
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60
Silica Brick	
Pennsylvania and Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00
	Per Net Ton
Chrome Brick	
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00
Magnesite Brick	
Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00
Grain Magnesite	
Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

RAILS, TRACK SUPPLIES
(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$40.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

CORROSION AND HEAT-RESISTING STEEL
(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

ELECTRICAL SHEETS
(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

"Curls" ... we thought he was a hairdresser until we found he was from Brooklyn and meant "coils" in a spring. No matter how you say it, when you talk springs, you're talking our language and we'll get along great ... without an interpreter ... for we try to be

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PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

Premium, $1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	36c.
L.c.l. lots	38c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.

Carload, bulk	34c.
L.c.l. lots	35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.35c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si	8.90c.	9.05c.	9.55c.
90-95% Si	11.05c.	11.20c.	11.65c.

Spot sales add: .45c. per lb. for 50% Si, .3c. per lb. or 75% Si .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

(Per Gross Ton, base 6.00 to 6.50 Si)

F.o.b. Jackson, Ohio	$29.50*
Buffalo	30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphoros or over.

*OPA price established 6-24-41.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb.-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% Cr, 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.00c.

PRICES

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten, 10,000 lb. or more... $1.90

Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per usual freight allowances, per lb. contained Va.
- Open Hearth $2.70
- Crucible $2.80
- Primos $2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal $1.50

Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5 ..... $1.10

Ferroboron, contract basis, 17.50% min. Bo, f.o.b. producer's plant with usual freight allowances, per lb. of alloy.
- 2000 lb. to carload $1.20
- Under 2000 lb. 1.30

Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)
- Carload lots ..... 25c.
- 2000 lb. to carload ..... 26c.

Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)
- Carload lots ..... 58c.
- 2000 lb. to carload ..... 59c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis
- No. 1 ..... 87.5c.
- No. 6 ..... 60c.
- No. 79 ..... 45c.

Bortram, f.o.b. Niagara Falls
- Ton lots, per lb..... 45c.
- Less ton lots, per lb. ..... 50c.

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.
- 2000 lb. lots $2.25
- Under 2000 lb. lots..... $2.30

Ferrotitanium, 40%-45%, f.o.b. 0.10c. max. Niagara Falls, N. Y., ton lots, per lb. contained Ti.. $1.23
- Less ton lots $1.25

Ferrotitanium, 20%-25%, 0.10 C max., ton lots, per lb. contained titanium $1.35
- Less ton lots $1.40

High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload $142.50

Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equaled with Rockdale, Tenn., per gross ton $58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo. 95c.

Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo ..... 80c.

Molybdenum oxide briquetes, 48%-52% Mo, f.o.b. Yangeloth, Pa., per lb. contained Mo ..... 80c.

Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo ..... 80c.

Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales
- Carload lots ..... 14c.

Zirconium, 12-15%, contract basis, lump, f.o.b. plant usual freight allowances, per lb. of alloy
- Carload, bulk ..... 4.6c.

Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk ..... 5.75c.
- Ton lots ..... 7.25c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.
- Car lots ..... 8.75c.
- Ton lots ..... 9.25c.

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